Motion control

Lexium 05

Catalogue
May
06

a brand of Schneider Electric

Telemecanique

Simply Smart !

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Flexibility

- Interchangeable modular functions, to better meet the requirements for extensions
- Software and accessories common to multiple product families

Ingenuity

- Auto-adapts to its environment, "plug & play"
- Application functions, control, communication and diagnostics embedded in the products
- User-friendly operation either directly on the product or remotely

Simplicity

- Cost effective “optimum” offers that make selection easy for most typical applications
- Products that are easy to understand for users, electricians and automation specialists
- User-friendly intuitive programming

Compactness

- High functionality in a minimum of space
- Freedom in implementation

Openness

- Compliance with field bus, connection, and software standards
- Enabling decentralised or remote surveillance via the web with Transparent Ready products

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Lexium 05 motion control
Presentation

Lexium 05 servo drive

BSH servo motor

An extended offer

The range of Lexium 05 servo drives that are compatible with BSH servo motors constitutes a compact and dynamic combination for machines across a wide power and supply voltage range:

- ■ Lexium 05 servo drive:
  - □ 100…120 V single phase, 0.4 to 1.4 kW
  - □ 200…240 V single phase, 0.75 to 2.5 kW
  - □ 200…240 V three-phase, 0.75 to 3.2 kW
  - □ 380…480 V three-phase, 1.4 to 6 kW
- ■ BSH servo motor:
  - □ Nominal torque: 0.42 to 33.5 Nm
  - □ Nominal speed: 1250 to 6000 rpm

The Lexium 05 range is enhanced by GBX planetary gearboxes. These are easy to mount, lubricated for life and available in 12 reduction ratios: 3:1 to 40:1.
GBX gearboxes are economical, and designed for applications requiring very limited play.

Lexium 05 servo drives comply with EN 50178 and IEC/EN 61800-3 international standards and carry UL (USA), cUL (Canada) approvals and CE marking.

A complete piece of equipment

Lexium 05 integrates functions and components that are usually external. This enables users to maintain particularly compact dimensions and makes it easier to integrate the servo drive in control enclosures or machines.

Electromagnetic compatibility (EMC)

The incorporation of “conducted and radiated” level A EMC filters in LXM 05●●●●F1, LXM 05●●●●M2 and LXM 05●●●●N4 servo drives simplifies installation and provides a very economical means of complying with CE marking requirements.
LXM 05●●●●M3X servo drives are available without an EMC filter. If compliance with EMC standards is required, filters which are available as an option can be installed by the customer.

Safety

The Lexium 05 servo drive is incorporated in the safety system of installations. It integrates the “Power Removal” safety function which prevents accidental starting of the motor.
This function is compliant with machine standard EN 954-1 category 3, standard IEC/EN 61508 SIL2 for electrical installations and draft standard IEC/EN 61800-5-2 for power drives.

Braking

Lexium 05 servo drives integrate a resistor as standard, which does away with the need to use an external braking resistor in most applications.

Lexium 05: A Telemecanique branded servo drive offer

Dynamic and powerful

Thanks to their new winding technology based on salient poles, BSH servo motors are compact and offer a high power density.
The low inertia of the rotor and the slight notching effect make it possible to meet demands for accuracy and dynamic performance.

This dynamic performance is enhanced by the fast sampling time of the Lexium 05 servo drive control loops:

- ■ 62.5 µs for the current loop
- ■ 250 µs for the speed loop
- ■ 250 µs for the position loop

Functions: pages 6 to 11, 54 and 55
Characteristics: pages 12 to 15, 56 to 79
References: pages 16, 80 to 82
Dimensions: pages 30 to 33, 83 to 85
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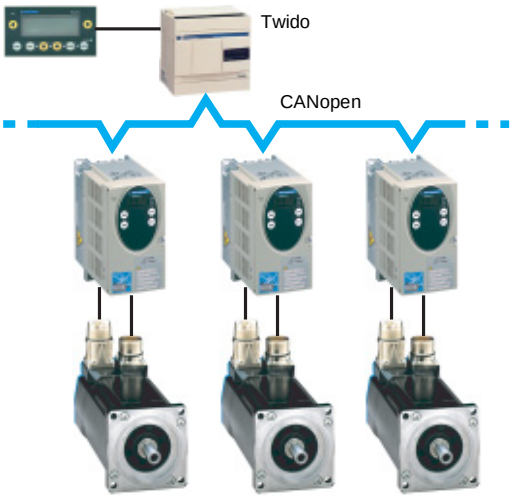
Lexium 05 motion control
Presentation



Control and interfaces

The Lexium 05 servo drive can control BSH servo motors in accordance with a large number of control modes:
- Point-to-point mode: relative and absolute movements
- Electronic gearing mode
- Speed control with acceleration/deceleration ramp
- Instantaneous speed control
- Current control
- Manual movement for easy setup

The Lexium 05 servo drive has three control interfaces as standard:
- Interface for CANopen, Modbus, or Profibus DP communication network
- Two ± 10 V analog reference inputs to give the speed or current reference, and limit the speed or current
- One RS 422 (A/B) incremental encoder or pulse/direction input. This input can also be configured as an output to emulate an encoder (ESIM).
- These interfaces are supplemented by logic inputs and outputs which can be used as Source (positive logic) or Sink (negative logic) in order to adapt to the outputs of controllers that are available on the market.

Simplicity

Integration

Its high integration level, compact size, the ability to mount it side by side, and its ability to operate at ambient temperatures of 50°C without derating, enable the size of enclosures to be reduced.
Low-power servo drives can be mounted on DIN rails.

Wiring

Spring terminals are used to save time, and avoid periodic checking of tightening torques.

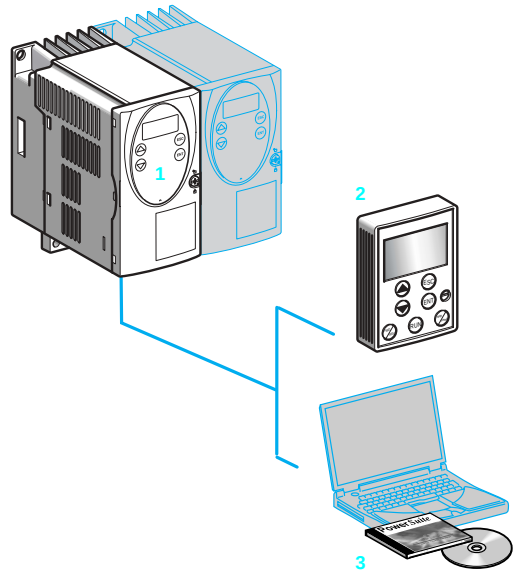
Setup

Thanks to the SinCos Hiperface® encoder of BSH motors, Lexium 05 automatically receives data from the servo motor.
The parameters of the servo motor do not need to be set manually.

The “Simply Start” menu, which is available with the PowerSuite software workshop, ensures that the installation operates within a few seconds.

The Lexium 05 auto-tuning function and its new algorithm automatically define the optimum gains of the control loops in accordance with the mechanics for different types of movement, including vertical movements.

The oscilloscope function of the PowerSuite software workshop is used to display the electrical and mechanical values of the axis. The Fourier series transform (FFT) can be used for fine analysis of the signals from the machine.



Dialogue tool

Integrated 7-segment display terminal 1

The Lexium 05 servo drive is supplied with an integrated 7-segment display terminal, which is used to set the servo drive parameters, display errors and monitor the system.
It is also used to control the servo drive in manual operation.

Remote LCD terminal 2

Available as an option, it can be mounted on an enclosure door so that the monitoring and adjustment functions and manual operation are always accessible. Its IP 65 protection enables it to be used in difficult environments.

PowerSuite 3

The PowerSuite software workshop is used to configure, set and debug the Lexium 05 axis in the same way as for all other Telemecanique variable speed drives and starters. It can be used with a direct connection or a Bluetooth® wireless connection.
See page 52.

Lexium 05 motion control
BSH servo motor and Lexium 05 servo drive combinations

BSH servo motors			Lexium 05 single-phase servo drives *(1)*								
			115 V single-phase, with integrated EMC input filter				**230 V single-phase**, with integrated EMC input filter				
			LXM 05●				**LXM 05●**				
			D10F1	**D17F1**	**D28F1**		**D10M2**	**D17M2**	**D28M2**		
	M_0	n_N	**0.4 kW**	**0.65 kW**	**1.4 kW**	n_N	**0.75 kW**	**1.2 kW**	**2.5 kW**		
BSH 0551T	**0.5 Nm**	3000 rpm	1.4 Nm			6000 rpm	1.4 Nm				
BSH 0552M	**0.9 Nm**					1500 rpm	2.3 Nm				
BSH 0552P	**0.9 Nm**					4000 rpm	2.7 Nm				
BSH 0552T	**0.9 Nm**	3000 rpm	1.77 Nm	2.7 Nm		6000 rpm	1.77 Nm				
BSH 0553M	**1.3 Nm**					1500 rpm	4.2 Nm				
BSH 0553P	**1.3 Nm**					4000 rpm	3.18 Nm				
BSH 0553T	**1.3 Nm**	3000 rpm		3.31 Nm		6000 rpm		3.31 Nm			
BSH 0701P	**1.4 Nm**					3000 rpm	3.2 Nm				
BSH 0701T	**1.4 Nm**	2500 rpm	2.42 Nm			5000 rpm		3.19 Nm			
BSH 0702M	**2.1 Nm**					1500 rpm	6.8 Nm				
BSH 0702P	**2.2 Nm**					3000 rpm	5.37 Nm	7.55 Nm			
BSH 0702T	**2.12 Nm**	2500 rpm		4.14 Nm		6000 rpm		4.14 Nm	6.8 Nm		
BSH 0703M	**2.8 Nm**					1500 rpm	10 Nm				
BSH 0703P	**3.1 Nm**					3000 rpm		7.28 Nm	10.3 Nm		
BSH 0703T	**2.8 Nm**	2500 rpm			7.38 Nm	6000 rpm			7.38 Nm		
BSH 1001T	**3.4 Nm**	2500 rpm			8.5 Nm	4000 rpm			8.5 Nm		
BSH 1002P	**5.8 Nm**					2000 rpm			18.3 Nm		
BSH 1003P	**7.8 Nm**					2000 rpm			22.79 Nm		

Where:
M_0 = stall torque
n_N = maximum nominal speed (see characteristics pages 56 to 78)

1.4 Nm	Peak stall torque that can be supplied by the BSH servo motor and Lexium 05 servo drive combination

*(1) In the reference, replace ● with **A** for the CANopen version with analog inputs, and with **B** for the Profibus DP version.*

Lexium 05 motion control
BSH servo motor and Lexium 05 servo drive combinations

BSH servo motors			Lexium 05 three-phase servo drives *(1)*							
			230 V three-phase, without integrated EMC input filter			400/480 V three-phase, with integrated EMC input filter			
			LXM 05● *(1)*			LXM 05● *(1)*			
			D10M3X	D17M3X	D42M3X		D14N4	D22N4	D34N4	D57N4
	M_0	n_N	0.75 kW	1.4 kW	3.2 kW	n_N	1.4 kW	2.0 kW	3.0 kW	6.0 kW
BSH 0551T	0.5 Nm	6000 rpm	1.4 Nm							
BSH 0552M	0.9 Nm	1500 rpm	2.3 Nm							
BSH 0552P	0.9 Nm	4000 rpm	2.7 Nm			6000 rpm	2.7 Nm			
BSH 0552T	0.9 Nm	6000 rpm	1.77 Nm							
BSH 0553M	1.3 Nm	1500 rpm	4.2 Nm							
BSH 0553P	1.3 Nm	4000 rpm	3.18 Nm			6000 rpm	3.87 Nm			
BSH 0553T	1.3 Nm	6000 rpm		3.31 Nm						
BSH 0701M	1.4 Nm	1500 rpm	3.2 Nm							
BSH 0701P	1.4 Nm	3000 rpm	3.2 Nm							
BSH 0701T	1.4 Nm	6000 rpm	2.41 Nm	3.19 Nm						
BSH 0702M	2.1 Nm	1500 rpm	6.8 Nm							
BSH 0702P	2.2 Nm	3000 rpm	5.37 Nm	7.55 Nm		6000 rpm	7.55 Nm			
BSH 0702T	2.12 Nm	4500 rpm			6.8 Nm					
BSH 0703M	2.8 Nm	1500 rpm	10 Nm			3000 rpm	10.3 Nm			
BSH 0703P	3.1 Nm	3000 rpm		7.28 Nm		6000 rpm		8.92 Nm		
BSH 0703T	2.8 Nm	6000 rpm			10.25 Nm					
BSH 1001M	3.4 Nm					2000 rpm	8.5 Nm			
BSH 1001P	3.3 Nm	2000 rpm		9.45 Nm		4000 rpm		9.45 Nm		
BSH 1001T	3.4 Nm	4000 rpm			8.5 Nm					
BSH 1002M	5.5 Nm					2000 rpm	16 Nm			
BSH 1002P	5.8 Nm	2000 rpm		12.35 Nm		4000 rpm		15.43 Nm		
BSH 1002T	5.52 Nm	4000 rpm			16 Nm					
BSH 1003M	7.8 Nm					2000 rpm		27.8 Nm		
BSH 1003P	8 Nm	2000 rpm			28.3 Nm	4000 rpm			26.97 Nm	
BSH 1004P	10 Nm	1500 rpm			30.41 Nm	3000 rpm			22.53 Nm	30.41 Nm
BSH 1401P	11.1 Nm					2500 rpm			26.2 Nm	
BSH 1401T	11.1 Nm	2500 rpm			24.77 Nm					
BSH 1402M	19.5 Nm					1250 rpm			57.1 Nm	
BSH 1402P	19.5 Nm	1500 rpm			46.72 Nm	3000 rpm				57.42 Nm
BSH 1402T	14.73 Nm	2000 rpm			25.04 Nm					
BSH 1403M	27.8 Nm					1500 rpm			76.66 Nm	88.17 Nm
BSH 1403P	27.8 Nm					3000 rpm				57.24 Nm
BSH 1404M	33.4 Nm					1500 rpm				126.45 Nm
BSH 1404P	33.4 Nm					3000 rpm				60.04 Nm
BSH 2051M	36 Nm					1500 rpm				68.3Nm

Where:
M_0 = stall torque
n_N = maximum nominal speed (see characteristics pages 56 to 78)

1.4 Nm — Peak stall torque that can be supplied by the BSH servo motor and Lexium 05 servo drive combination

*(1) In the reference, replace ● with **A** for the CANopen version with analog inputs, and with **B** for the Profibus DP version.*

Lexium 05 motion control
Lexium 05 servo drives

General overview of Lexium 05 functions

The Lexium 05 servo drive integrates a large number of functions, enabling it to be used in a wide range of industrial applications.

There are two main function families:
- Conventional adjustment functions, such as:
  - Homing
  - Manual mode
  - Auto-tuning of the servo drive/servo motor combination

- Operating modes:
  - Position control:
    - Point-to-point mode
    - Electronic gearing mode
  - Speed control:
    - Speed control with acceleration/deceleration ramp
    - Instantaneous speed control
  - Current control:
    - Current regulation

Two types of operation are possible:
- Local mode
- Fieldbus mode

In local mode:
The servo drive parameters are defined via:
- The user interface
- The remote display terminal
- The PowerSuite software

Movements are then determined by:
- Analog signals (± 10 V)
- RS 422 type signals (pulse/direction or A/B signals)

In this mode, limit switches and homing switches are not managed by the servodrive.

In fieldbus mode:
- All the servo drive parameters and those associated with the operating modes can be accessed via:
- The fieldbus, in addition to the access via the user interface
- The remote display terminal
- The PowerSuite software

Homing

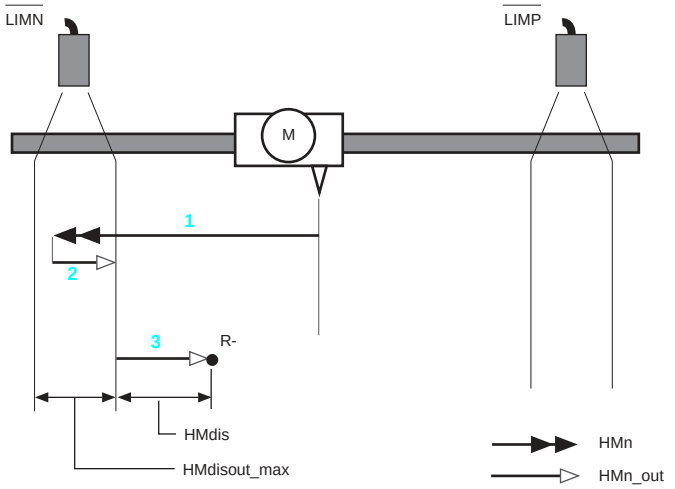
Before performing an absolute movement in point-to-point mode, a homing operation must be carried out.
Homing consists of associating an axis position with a known mechanical position. This position then becomes the reference position for any subsequent movement of the axis.

Homing is carried out by:
- Immediately writing the actual position register
- Movements up to a reference sensor

Homing with search for sensors

Four types of homing with movement to sensors are possible:
- Homing on - limit switch, "LIMN"
- Homing on + limit switch, "LIMP"
- Homing on reference contact "REF" with initial movement in negative direction of rotation
- Homing on reference contact "REF" with initial movement in positive direction of rotation

These homing movements can be performed with or without taking the "Zero marker" pulse into account.

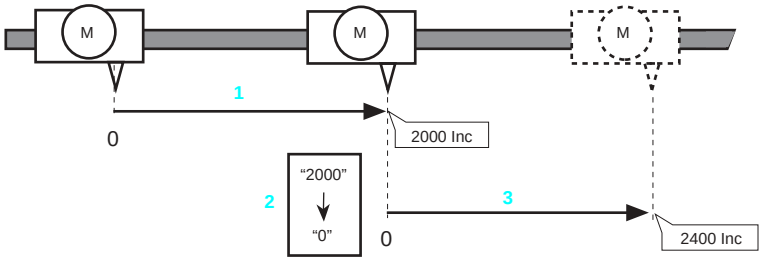


1 Move at search speed HMn
2 Move at output speed HMn_out
3 Clearance at distance HMdis at output speed HMn_out

Homing operating mode: Example with limit switch and clearance from sensor edge

Forced homing

Forced homing consists of setting the current motor position as the new reference point to which all subsequent positioning data refer.



After power-up, the position value is 0
1 Start movement towards the home point: the servo motor is positioned using a relative movement of 2000 increments
2 Forced homing to value 0 by writing the actual position expressed in user units
3 Initiation of a command to move 2400 increments to the absolute position. The target position is 2400 increments (4400 increments if forced homing had not been performed).

Forced homing operating mode

Homing parameters

The homing parameters are transmitted via the fieldbus or using PowerSuite software.

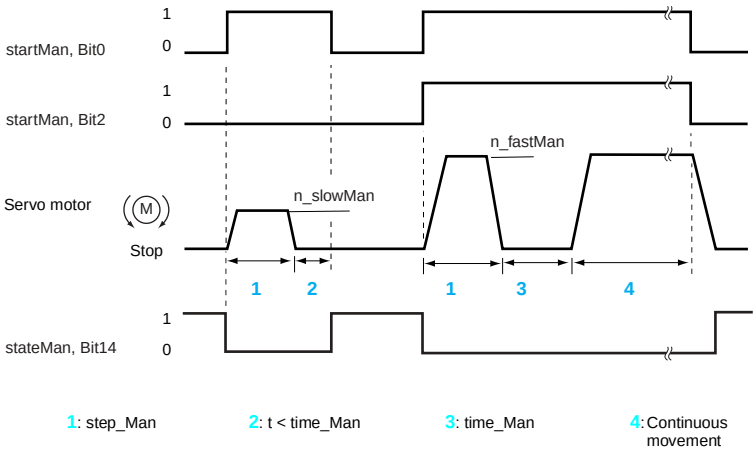
Lexium 05 motion control
Lexium 05 servo drives
Adjustment functions

Manual mode

This mode enables an axis to be moved manually. The movement can be carried out over one movement step or continuously, at constant speed. Two speeds of movement are available (slow or fast). Various parameters are used to configure the manual movement.

Setpoint value

The parameters are transmitted via the fieldbus, the PowerSuite software or the servo drive user interface.



Adjustment of the machine in manual mode

On a rising edge of a “startMan” control bit, a movement step is performed 1 at low or high speed depending on the command on a second bit, “speedMan”.
If the “startMan” control bit is maintained active beyond the waiting time “timeMan” - example 3 -, the movement is restarted and continues 4 monitored by the operator, until the “startMan” command returns to inactive level.
A “stateMan” bit reflects the state - ready/rotating - of the servo motor in manual mode.

Auto-tuning of the servo drive/servo motor combination

The auto-tuning function integrated in the servo drive enables automatic tuning of the servo control parameters to be performed after the initial configuration.
This function is activated via:
- The user interface
- The remote display terminal
- The PowerSuite software

This procedure requires the servo motor to be coupled to its mechanism. Additional parameters can be used to limit the amplitude and the direction of the movements performed during the auto-tuning phase.

The PowerSuite software also provides screens for carrying out these servo control adjustments conventionally.

Lexium 05 motion control

Lexium 05 servo drives

Operating modes

Operating mode

The following table summarizes the various possible operating modes, the control types and the sources of setpoint values.

Operating mode	Control		Setpoint value via
	via fieldbus	local	
Point-to-point mode	■	□	Fieldbus or PowerSuite software
Electronic gearing mode	■	■	Pulse/direction signals or A/B signals
Speed control with ramp	■	□	Fieldbus or PowerSuite software
Instantaneous speed control	■	■	Analog input, fieldbus or PowerSuite software
Current control	■	■	Analog input, fieldbus or PowerSuite software

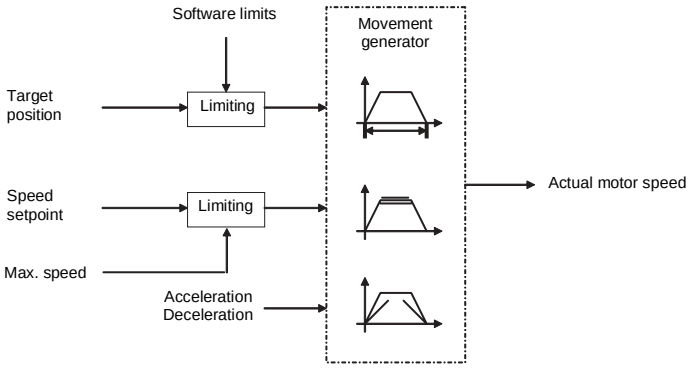
■ Functions available
□ Functions not available

Point-to-point mode

This mode, also referred to as PTP (Point To Point), is used to move the axis from a position A to a position B. The movement can be absolute: this consists of expressing position B in relation to a home position (the axis must have previously been referenced), or relative: in this case the movement is performed in relation to the current position of the axis (A). The movement is performed according to acceleration, deceleration and speed parameters.

Setpoint value

The homing parameters are transmitted via the fieldbus or using the PowerSuite software.



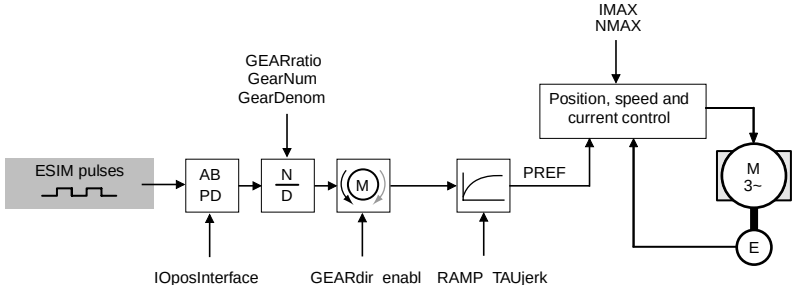
Point-to-point mode, absolute and relative

Possible applications

A motion controller for coordinated axes or a PLC can manage several axes controlled via fieldbus. This mode is often used in material handling, automated inspection, etc.

Electronic gearing mode

In this mode a master/slave relationship is established between a number of Lexium 05 or between a Lexium 05 and an external master (external A/B encoder, pulse/direction signals). This relationship can be assigned a fixed or variable ratio. The ratio and operating direction parameters can be accessed dynamically via fieldbus.



Lexium 05 motion control
Lexium 05 servo drives
Operating modes

Electronic gearing mode (continued)

Possible applications

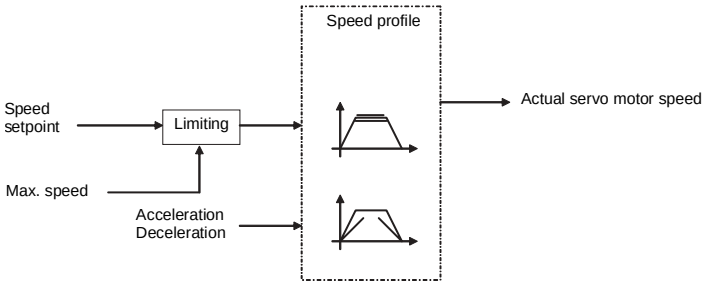
This mode is used in material handling, conveying and sectional production line applications, as well as in the fields of plastics and fibres.

Speed control with acceleration/deceleration ramp

In this operating mode, the speed setpoint is applied according to an acceleration/deceleration ramp that can be adjusted using parameters. The speed setpoint can be modified during the movement. Current limiting is also possible.
The position control that is present in the background allows flexible synchronization of two axes that are in speed control mode, and enables position control mode to be entered on the fly.

Setpoint value

The setpoint value is transmitted via the fieldbus or using the PowerSuite software.



Speed control with acceleration/deceleration ramp operating mode

Possible applications

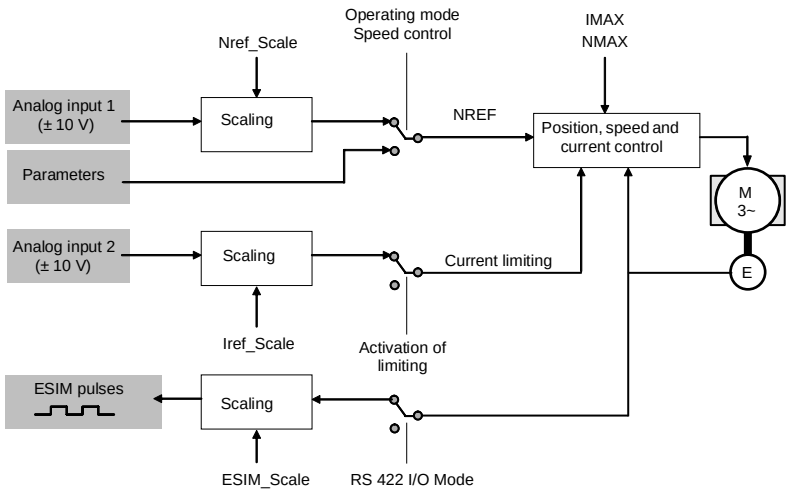
This mode is mainly used with infinite axes.
Examples include turntable management, printing, labelling applications, etc.

Instantaneous speed control

In this mode the Lexium 05 servo drive can be used with an analog output motion controller. It is suitable for all other high performance speed control requirements.

Setpoint value

The setpoint value is transmitted via analog input 1, the fieldbus or the PowerSuite software. Analog input 2 can be used for current or speed limiting.



Instantaneous speed control operating mode

Use with analog output motion controller

The axis position feedback can be provided to the motion controller by the ESIM (Encoder SIMulation) output on the Lexium 05 servo drive.

Lexium 05 motion control
Lexium 05 servo drives
Operating modes

Instantaneous speed control (continued)

Possible applications

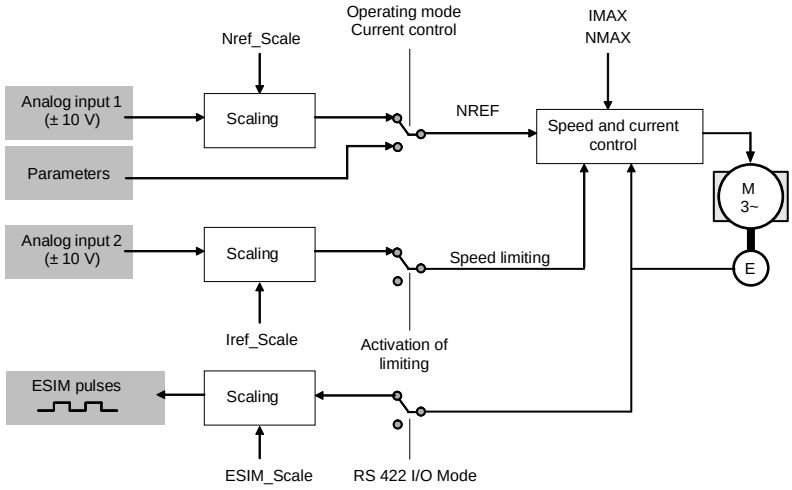
- Material handling
- Packaging
- Cutting to length
- Winding and unwinding applications

Current control

Current control is necessary for servo motor torque control. This mode, which can be provided in addition to the other modes, is used in machine phases where torque control is crucial.

Setpoint value

The setpoint value is transmitted via analog input 1, the fieldbus or the PowerSuite software. Analog input 2 can be used for current or speed limiting. The position and speed of the servo motor are transmitted to the motion controller by the encoder simulation signals (ESIM) of the RS 422 interface.



Current control operating mode, effects of the adjustable parameters

Possible applications

- Car assembly applications (tool fixing machine)
- Special machines

Other functions

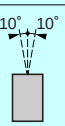
Other functions for monitoring and setting operating parameters can be activated via:

- The “logic” I/O
- The fieldbus
- The PowerSuite software
- The servo drive user interface

- Control functions:
  - Status monitoring in movement mode
  - Monitoring of the axis signals
  - Monitoring of the internal signals specific to the servo drive
  - Monitoring switching
  - Monitoring the communication on the fieldbus
- Entering the various scaling factors
- Adjusting the movement generator
- Activation of the STOP signal
- Triggering the fast stop function (Quick-Stop)
- Activation of the motor brake via the HBC (Holding Brake Controller)
- Reversing the direction of rotation of the motor
- Reading the analog input values
- Determining the logic of the signals

Lexium 05 motion control
Lexium 05 servo drives

Environmental characteristics

Conformity to standards			Lexium 05 servo drives have been developed to conform to the strictest international standards and the recommendations relating to electrical industrial control equipment (IEC, EN), including: low voltage, IEC/EN 61800-5-1, IEC/EN 50178, IEC/EN 61800-3 (conducted and radiated EMC immunity and emissions)
EMC immunity			IEC/EN 61800-3, environments 1 and 2 IEC/EN 61000-4-2 level 3 IEC/EN 61000-4-3 level 3 IEC/EN 61000-4-4 level 4 IEC/EN 61000-4-5 level 3
Conducted and radiated EMC emissions for servo drives			IEC/EN 61800-3, environments 1 and 2, categories C2, C3
	LXM 05●D10F1…D28F1 LXM 05●D10M2...D28M2 LXM 05●D14N4...D57N4		EN 55011 class A group 2, IEC/EN 61800-3 category C3 With additional EMC filter *(1)*: EN 55011 class A group 1, IEC/EN 61800-3 category C2
	LXM 05●D10M3X...D42M3X		With additional EMC filter *(1)*: EN 55011 class A group 1, IEC/EN 61800-3 category C2
CE marking			The drives are CE marked in accordance with the European low voltage (73/23/EEC and 93/68/EEC) and EMC (89/336/EEC) directives
Product certification			UL (USA), cUL (Canada)
Degree of protection			IEC/EN 61800-5-1, IEC/EN 60529
	LXM 05●D10F1…D28F1 LXM 05●D10M2...D28M2 LXM 05●D10M3X...D42M3X LXM 05●D14N4...D57N4		IP 41 on the upper part with protective cover in place IP 20 after removal of the protective cover (see page 48)
Vibration resistance	LXM 05●D10F1…D28F1 LXM 05●D10M2...D28M2 LXM 05●D10M3X...D42M3X LXM 05●D14N4...D57N4		According to IEC/EN 60068-2-6: 1.5 mm peak to peak from 3 Hz to 13 Hz 1 gn from 13 Hz to 150 Hz
Shock resistance	LXM 05●D10F1…D28F1 LXM 05●D10M2...D28M2 LXM 05●D10M3X...D42M3X LXM 05●D14N4...D57N4		According to IEC/EN 61131 paragraph 6.3.5.2 15 gn for 11 ms conforming to IEC/EN 600028-2-27
Maximum ambient pollution	LXM 05●D10F1…D28F1 LXM 05●D10M2...D28M2 LXM 05●D10M3X...D42M3X LXM 05●D14N4...D57N4		Degree 2 conforming to IEC/EN 61800-5-1
Environmental conditions	LXM 05●D10F1…D28F1 LXM 05●D10M2...D28M2 LXM 05●D10M3X...D42M3X LXM 05●D14N4...D57N4		IEC 60721-3-3 classes 3C1
Relative humidity			According to IEC 60721-3-3, class 3K3, 5% to 93%, without condensation
Ambient air temperature around the device	Operation	**°C**	- 10…+ 50 Temperature derating and limitations: see mounting recommendations page 48
	Storage	**°C**	- 25…+ 70
Type of cooling	LXM 05●D10F1 LXM 05●D10M2 LXM 05●D10M3X		Natural convection
	LXM 05●D17F1...D57N4		Fan
Maximum operating altitude		**m**	1000 without derating Up to 2000 under the following conditions: ■ Temperature 40°C max. ■ Mounting distance between servo drives > 50 mm ■ Protective film removed
Operating position Maximum permanent angle in relation to the normal vertical mounting position			

(1) See table on page 27 to check permitted cable lengths.

Drive characteristics

Switching frequency		**kHz**	4 or 8 depending on rating and associated servo motor. See pages 56 to 78

Electrical power characteristics

Power supply	Voltage	**V**	100 - 15%...120 + 10% single phase for LXM 05●D10F1…D28F1 200 - 15%...240 + 10% single phase for LXM 05●D10M2...D28M2 200 - 15%...240 + 10% three-phase for LXM 05●D10M3X...D42M3X 380 - 15%...480 + 10% three-phase for LXM 05●D14N4...D57N4
	Frequency	**Hz**	50 - 5%...60 + 5%
	Transient overvoltage		Overvoltage category III
	Inrush current	**A**	< 60
	Leakage current	**mA**	< 30
External 24 V ⎓ power supply (not provided) *(1)*	Input voltage	**V**	24 (-15 / +20%)
	Input current (no-load)	**A**	1
	Ripple		⩽ 5%
Signalling			1 red LED: LED lit indicates the presence of servo drive voltage
Output voltage			Maximum three-phase voltage equal to line supply voltage
Electrical isolation			Between power and control sections (inputs, outputs, power supplies)

Connection cable characteristics

Recommended cable type for mounting in an enclosure		Single-strand IEC cable, ambient temperature 45°C, copper 90°C XLPE/EPR or copper 70°C PVC

Connection characteristics (terminals for the power supply, the DC bus, and the servo motor)

Servo drive terminals		**R/L1, S/L2, T/L3 (power supply)**	**PA/+, PBl, PBe (external braking resistor)**	**U/T1, V/T2, W/T3 (servo motor)**
Maximum wire size and tightening torque for the power supply, servo motor, braking resistor and DC bus terminals	LXM 05●D10F1 LXM 05●D10M2 LXM 05●D10M3X	2.5 mm^2 (AWG 14) 0.8 Nm	2.5 mm^2 (AWG 14) 0.8 Nm	See characteristics of VW3 M5 10● R●●● cables on page 79
	LXM 05●D17F1 LXM 05●D17M2 LXM 05●D17M3X LXM 05●D14N4	6.0 mm^2 (AWG 10) 1.2 Nm	6.0 mm^2 (AWG 10) 1.2 Nm	
	LXM 05●D28F1 LXM 05●D22N4 LXM 05●D28M2 LXM 05●D42M3X LXM 05●D34N4	6.0 mm^2 (AWG 10) 1.2 Nm	6.0 mm^2 (AWG 10) 1.2 Nm	
	LXM 05●D57N4	16.0 mm^2 (AWG 6) 2.2 Nm	16.0 mm^2 (AWG 6) 2.2 Nm	

(1) Please consult our specialist catalogue "Interfaces, I/O splitter boxes and power supplies".

Control signal characteristics

Protection	Inputs		Against reverse polarity
	Outputs		Against short-circuits
Electrical link			Presence of an electrical link on the 0 V ⎓
24 V ⎓ I/O logic			Positive or negative (default: positive)
Logic inputs			
	Number		4
	Power supply	**V ⎓**	24
	Sampling period	**ms**	0.25
	Debounce filtering	**ms**	1
	Positive logic *(Sink)*		State 0 if < 5 V or input not wired, state 1 if > 15 V Logic inputs conforming to standard IEC/EN 61132-2 type 1
	Negative logic *(Source)*		State 0 if > 19 V or logic input not wired, state 1 if < 9 V
Safety inputs PWRR_A, PWRR_B			
	Type		Inputs for the "Power Removal" safety function
	Number		2
	Power supply	**V ⎓**	24
	Input filtering	**ms**	1
	Response time	**ms**	⩽ 10
	Positive logic *(Sink)*		State 0 if < 5 V or input not wired, state 1 if > 15 V Logic inputs conforming to standard IEC/EN 61132-2 type 1
Logic outputs			
	Type		24 V ⎓ logic outputs: positive logic (Source) or negative logic (Sink)
	Number		2
	Output voltage	**V**	⩽ 30, conforming to standard IEC/EN 61131-2
	Sampling period	**ms**	1
	Max. breaking current	**mA**	50
	Voltage drop	**V**	1 (at 50 mA load)
Analog inputs *(1)*			
			ANA1+/ANA1- / **ANA2+/ANA2-**
	Resolution	**bit**	14
	Range		Differential ± 10 V
	Input resistance	**kΩ**	⩾ 10
	Sampling period	**µs**	250
	Absolute error		Less than ±1%, less than ±2% over the temperature range
	Linearity		Less than ±0.5%
Pulse/direction, A/B encoder signals			
Type			RS 422 link
Common mode range		**V**	- 7...+ 12
Input resistance		**kΩ**	5
Input frequency	Pulse/direction	**kHz**	⩽ 200
	A/B signals	**kHz**	⩽ 400
ESIM (encoder emulation) output signals			
Logic level			RS 422 link
Output frequency		**kHz**	⩽ 450
Servo motor encoder feedback signals			
Voltages	Encoder power supply	**V**	+ 10 /100 mA
	SinCos input signals	**V**	1 V_{SS} with 2.5 V offset 0.5 V_{SS} at 100 kHz
Input resistance		Ω	120

Operational safety characteristics

Protection	Of the machine		"Power Removal" (PWR) safety function which forces stopping and/or prevents unintended operation of the servo motor, conforming to EN 954-1 category 3 and draft standard IEC/EN 61800-5-2
	Of the system process		"Power Removal" (PWR) safety function which forces stopping and/or prevents unintended operation of the servo motor, conforming to IEC/EN 61508 level SIL2 and draft standard IEC/EN 61800-5-2

(1) Only available on LXM 05AD●●●●● servo drives.

Communication port characteristics

CANopen protocol, LXM 05AD●●●●● servo drives

Structure	Connectors	RJ45 (labelled CN4) or spring terminals (labelled CN1)
	Network management	Slave
	Transmission speed	125 kbps, 250 kbps, 500 kbps or 1 Mbps
	Address (Node ID)	1 to 127, configurable via the display terminal or the PowerSuite software workshop
	Polarization	Line termination impedances are integrated in the servo drive and are switchable
Services	PDO	Implicit exchange of PDO (Process Data Objects): ■ 3 PDO conforming to DSP 402 modes (position control and speed profile modes) ■ 1 configurable mapping PDO
	PDO modes	Event-triggered, Time-triggered, Remotely-requested, Sync (cyclic), Sync (acyclic)
	PDO mapping	1 configurable PDO
	Number of SDO	Explicit exchange of SDO (Service Data Objects): ■ 2 receive SDO ■ 2 transmit SDO
	Emergency	Yes
	Profile	CiA DSP 402: CANopen “Device Profile Drives and Motion Control” Position control and speed profile modes
	Communication monitoring	Node guarding, heartbeat
Diagnostics	Using LEDs	2 LEDs: “RUN” and “ERROR” on integrated 7-segment display terminal Display of faults Full diagnostics with the PowerSuite software workshop
Description file		A single eds file for the whole range is supplied on the documentation CD-ROM. This file contains the description of the servo drive parameters

Modbus Protocol, LXM 05●D●●●●● servo drives

Structure	Connector	RJ45 (labelled CN4)
	Physical interface	2-wire RS 485 multidrop
	Transmission mode	RTU
	Transmission speed	Configurable via the display terminal or the PowerSuite software workshop: 9600, 19200, or 38400 bps
	Format	Configurable via the display terminal or the PowerSuite software workshop: ■ 8 bits, odd parity, 1 stop ■ 8 bits, even parity, 1 stop ■ 8 bits, no parity, 1 stop ■ 8 bits, no parity, 2 stop
	Polarization	No polarization impedances These must be provided by the wiring system (for example, in the master)
	Number of servo drives	31 Lexium 05 servo drives maximum
	Address	1 to 247, configurable via the display terminal or the PowerSuite software workshop.
Services	Messaging	Read Holding Registers (03) 63 words maximum Write Single Register (06) Write Multiple Registers (16) 61 words maximum Read/Write Multiple Registers (23) 63/59 words maximum Read Device Identification (43) Diagnostics (08)
	Communication monitoring	Monitoring function (node guarding) can be activated “Time out” can be set between 0.1 s and 10s
Diagnostics		Display of faults on integrated 7-segment display terminal

Profibus DP protocol, LXM 05BD●●●●● servo drives

Structure	Connector	Spring terminals (labelled CN1)
	Physical interface	2-wire RS 485 multidrop
	Transmission speed	9600 bps, 19.2 kbps, 45.45 kbps, 93.75 kbps, 187.5 kbps, 500 kbps, 1.5 Mbps, 3 Mbps, 6 Mbps or 12 Mbps
	Address	1 to 126, configurable via the integrated 7-segment display terminal or the PowerSuite software workshop
Services	Periodic variables	PPO type 2 8 PKW bytes 12 Process Data bytes
	Communication monitoring	Can be inhibited “Time out” can be set via the Profibus DP network configurator
Diagnostics		Two LEDs: RUN and ERR Display of faults on integrated 7-segment display terminal Full diagnostics with the PowerSuite software workshop
Description file		A single gsd file for the whole range is supplied on the documentation CD-ROM. This file does not contain the description of the servo drive parameters

Lexium 05 motion control
Lexium 05 servo drives

LXM 05●D10F1
LXM 05●D10M2
LXM 05●D10M3X

LXM 05●D17F1
LXM 05●D17M2
LXM 05●D17M3X
LXM 05●D14N4

LXM 05●D28F1
LXM 05●D28M2
LXM 05●D42M3X
LXM 05●D22N4
LXM 05●D34N4

LXM 05●D57N4

Lexium 05 servo drives

Output current Continuous (RMS) at 4 kHz	Output current Continuous (RMS) at 8 kHz	Output current Peak (RMS) (2) at 4 kHz	Output current Peak (RMS) (2) at 8 kHz	Nominal power at 4 kHz	Line current at U1 (3)	Line current at U2 (3)	Max. prospective line Isc	Reference (1)	Weight
A	A	A	A	kW	A	A	kA		kg
Single-phase supply voltage: 110…120 V ∿ (3) 50/60 Hz, with integrated EMC filter									
4	3.2	7	6	0.4	7.6	7	1	**LXM 05AD10F1**	1.100
8	7	12	11	0.65	11.5	10.5	1	**LXM 05AD17F1**	1.400
15	13	20	20	0.85	22.6	20.7	1	**LXM 05AD28F1**	2.000
Single-phase supply voltage: 200…240 V ∿ (3) 50/60 Hz, with integrated EMC filter									
4	3.2	7	6	0.75	8.1	6.7	1	**LXM 05AD10M2**	1.100
8	7	12	11	1.2	12.7	10.5	1	**LXM 05AD17M2**	1.400
15	13	20	20	2.5	23	19.2	1	**LXM 05AD28M2**	2.000
Three-phase supply voltage: 200…240 V ∿ (3) 50/60 Hz, without integrated EMC filter									
4	3.2	7	6	0.75	5.2	4.3	5	**LXM 05AD10M3X**	1.100
8	7	12	11	1.4	9	7.5	5	**LXM 05AD17M3X**	1.300
17	15	30	30	3.2	19	15.8	5	**LXM 05AD42M3X**	1.900
Three-phase supply voltage: 380…480 V ∿ (3) 50/60 Hz, with integrated EMC filter									
6	5	10	7.5	1.4	4.2	3.3	5	**LXM 05AD14N4**	1.400
9	7	16	14	2	6.3	5	5	**LXM 05AD22N4**	2.000
15	11	24	18	3	9.7	7.7	5	**LXM 05AD34N4**	2.000
25	20	40	30	6	17.7	14	22	**LXM 05AD57N4**	4.800

(1) References for models with Profibus DP communication: replace **LXM 05A** *with* **LXM 05B** *at the beginning of the reference.*
(2) Maximum value for 3 seconds.
(3) Nominal supply voltage, min. U1, max. U2: 110 (U1)…120 V (U2), 200 (U1)…240 V (U2), 380 (U1)…480 V (U2).

VW3 A31101

Separate parts

The Lexium 05 servo drive can be connected to a remote display terminal. The remote display terminal can be mounted on the door of an enclosure with IP 65 protection on the front panel.
The terminal provides access to the same functions as the integrated display and keypad on the servo drive. It can be used to:

- Configure, adjust and control the servo drive remotely
- Provide a remote display

Description	Use	Reference	Weight kg
Remote display terminal	For all Lexium 05. Kit comprising: ■ Display terminal, 5 m cable equipped with 2 connectors ■ Seal and screws for IP 65 mounting on an enclosure door	**VW3 A31101**	0.380
Plates for mounting on ⊔ rail width 35 mm	For LXM 05●D10F1/M2/M3X	**VW3 A11851**	0.200
	For LXM 05●D17F1/M2/M3X and LXM 05●D14N4	**VW3 A31852**	0.220

Connectors

Description		Reference	Weight kg
Molex connectors	10-way female connectors for CN5	**VW3 M8 212**	–
(order in multiples of 5)	12-way female connectors for CN2	**VW3 M8 213**	–

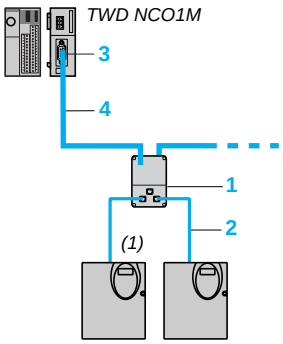
Documentation

Description		Reference	Weight kg
Simplified Lexium 05 user's manual and CD-ROM, containing: ■ A variables user's manual ■ A Modbus and CANopen user's manual ■ A Profibus DP user's manual	Supplied with the Lexium 05 servo drive	–	–

Note: *The manuals and quick reference guides for servo drives and servo motors are available on the website: www.telemecanique.com.*

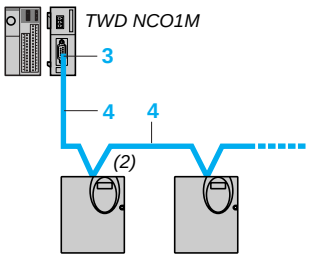
Lexium 05 motion control
Lexium 05 servo drives

Twido



Connection to Lexium 05AD via RJ45 connector (CN4)

Twido

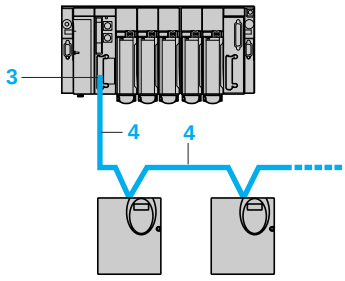


Connection to Lexium 05AD via spring terminals (CN1)

TSX CAN KCDF 90T

TSX CAN CA/CB/CD

Premium



Connection to Lexium 05BD via spring terminals (CN1)

CANopen machine bus

The Lexium 05AD servo drive can be connected directly to the CANopen machine bus via spring terminals, or using an RJ45 connector (which supports the CANopen and Modbus protocols).
The communication function provides access to the servo drive's configuration, adjustment, control and monitoring functions.
Each servo drive incorporates line terminators that can be disconnected via a switch.

Connection via RJ45 connector (CN4)

Designation	Description	Item no.	Reference	Weight kg
IP 20 junction box	2 RJ45 ports	1	**VW3 CAN TAP2**	0.480

Designation	Description	Length m	Item no.	Reference	Weight kg
Cables for CANopen bus	2 RJ45 connectors	0.3	2	**VW3 CAN CARR03**	0.050
		1	2	**VW3 CAN CARR1**	0.500

Connection via terminals (CN1)

Designation	Description	Item no.	Reference	Weight kg
CANopen IP 20 SUB-D connector (controller side)	90° angled female 9-way SUB-D. Switch for line terminator	3	**TSX CAN KCDF90 T**	0.046

CANopen cables *(3)*

Description	Length m	Item no.	Reference	Weight kg
Standard cables, CE marking Low smoke emission, halogen-free Flame retardant (IEC 60332-1)	50	4	**TSX CAN CA 50**	4.930
	100	4	**TSX CAN CA 100**	8.800
	300	4	**TSX CAN CA 300**	24.560
UL certification, CE marking Flame retardant (IEC 60332-2)	50	4	**TSX CAN CB 50**	3.580
	100	4	**TSX CAN CB 100**	7.840
	300	4	**TSX CAN CB 300**	21.870
Cable for harsh environments *(4)* or mobile installations, CE marking Low smoke emission, halogen-free Flame retardant (IEC 60332-1)	50	4	**TSX CAN CD 50**	3.510
	100	4	**TSX CAN CD 100**	7.770
	300	4	**TSX CAN CD 300**	21.700

Profibus DP fieldbus

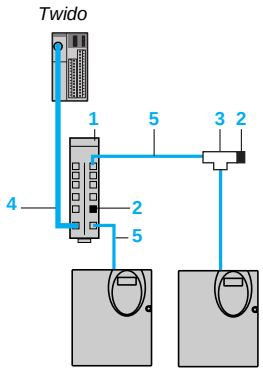
The Lexium 05BD servo drive can be connected directly to the Profibus DP bus via spring terminals.
The communication function provides access to the same functions as those described for CANopen.

Cables

Designation	Length m	Item no.	Reference	Weight kg
Profibus DP trunk cables	**100**	4	**TSX PBS CA 100**	–
	400	4	**TSX PBS CA 400**	–

(1) RJ45 connector CN4
(2) Spring terminals CN1, terminals 21, 22, 23.
(3) For other CANopen bus connection accessories, please consult our catalogue "Machines & installations with CANopen".
(4) Harsh environment:
- *Resistance to hydrocarbons, industrial oils, detergents, solder splashes*
- *Relative humidity up to 100%*
- *Saline atmosphere*
- *Significant temperature variations*
- *Operating temperature between - 10°C and + 70°C*

Lexium 05 motion control
Lexium 05 servo drives



Lexium 05AD connection via RJ45 connector (CN4)

TSX SCA50

TSX SCA62

LU9 GC3

Modbus serial link

The Lexium 05 servo drive can be connected directly to Modbus using an RJ45 connector (which supports the Modbus and CANopen protocols).
The communication function provides access to the servo drive's configuration, adjustment, control and monitoring functions.

Connection accessories

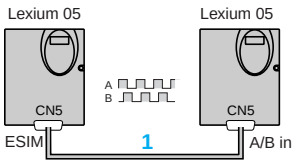
Description			Length m	Item no.	Unit reference	Weight kg
Junction box 3 screw terminals, RC line terminator To be connected using cable VW3 A8 306 D30			–	–	**TSX SCA 50**	0.520
Subscriber socket 2 15-way female SUB-D connectors and 2 screw terminals, RC line terminator To be connected using cable VW3 A8 306			–	–	**TSX SCA 62**	0.570
Modbus splitter block 10 RJ45 connectors and 1 screw terminal			–	1	**LU9 GC3**	0.500
Modbus line terminator (2)	For RJ45	R = 120 Ω, C = 1 nf	–	2	**VW3 A8 306 RC**	0.200
		R = 150 Ω	–	2	**VW3 A8 306 R**	0.200
	For screw terminals	R = 120 Ω, C = 1 nf	–	–	**VW3 A8 306 DRC**	0.200
		R = 150 Ω	–	–	**VW3 A8 306 DR**	0.200
Modbus RJ45 T-junction boxes (with integrated cable)			0.3	3	**VW3 A8 306 TF03**	0.190
			1	3	**VW3 A8 306 TF10**	0.210
Cable for Twido controller serial link 1 mini-DIN connector, 1 RJ45 connector			0.3	4	**TWD XCA RJ 003**	–
			1	4	**TWD XCA RJ 010**	0.090
			3	4	**TWD XCA RJ 030**	0.160

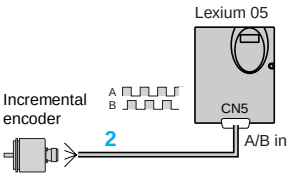
Connection cables

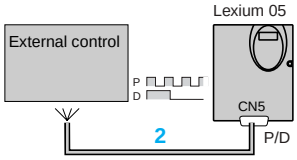
Description	Connectors	Length m	Item no.	Reference	Weight kg
Cables for Modbus connection	1 RJ45 connector and one end with flying leads	3	–	**VW3 A8 306 D30**	0.150
	1 RJ45 connector and 1 15-way male SUB-D connector for TSX SCA 62	3	–	**VW3 A8 306**	0.150
	2 RJ45 connectors	0.3	5	**VW3 A8 306 R03**	0.050
		1	5	**VW3 A8 306 R10**	0.050
		3	5	**VW3 A8 306 R30**	0.150
RS 485 double shielded twisted pair Modbus cables	Supplied without connector	100	–	**TSX CSA 100**	5.680
		200	–	**TSX CSA 200**	10.920
		500	–	**TSX CSA 500**	30.000

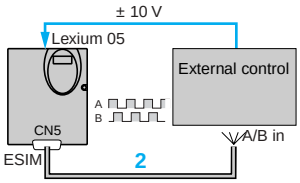
(1) For connections for other PLCs, please consult our specialist automation product catalogues.
(2) Sold in lots of 2.

Lexium 05 motion control
Lexium 05 servo drives









Lexium 05 servo drives

Equipped cables for Modicon Premium motion control modules *(1)*

From	To	Length m	Reference	Weight kg
Lexium 05 servo drive Simulated incremental encoder feedback interface	TSX CAY ●● Premium module, encoder input. *Cables equipped with a 10-way Molex connector on the Lexium 05 side (CN5), and a 15-way SUB-D connector on the TSX CAY ●● side*	0.5	**VW3 M8 203 R05**	0.020
		1.5	**VW3 M8 203 R15**	0.030
		3	**VW3 M8 203 R30**	0.040
		5	**VW3 M8 203 R50**	0.050
TSX CFY ●● Premium module	Lexium 05 servo drive, pulse/direction interface *Cables equipped with a 10-way Molex connector on the Lexium 05 side (CN5), and a 15-way SUB-D connector on the TSX CFY ●● side*	0.5	**VW3 M8 204 R05**	0.020
		1.5	**VW3 M8 204 R15**	0.030
		3	**VW3 M8 204 R30**	0.040
		5	**VW3 M8 204 R50**	0.050

Equipped cables for RS 422 control

From	To	Length m	Item no.	Reference	Weight kg
Lexium 05 servo drive	Lexium 05 servo drive, master/slave connection *Cables equipped at both ends with a 10-way Molex connector for CN5*	0.5	1	**VW3 M8 202 R05**	0.025
		1.5	1	**VW3 M8 202 R15**	0.035
		3	1	**VW3 M8 202 R30**	0.045
		5	1	**VW3 M8 202 R50**	0.055
External encoder, external control	Lexium 05 servo drive (CN5 A/B input) (CN5 pulse/direction input)	0.5	2	**VW3 M8 201 R05**	0.020
		1.5	2	**VW3 M8 201 R15**	0.030
Lexium 05 servo drive	External or other type of control *Cables equipped at one end with a 10-way Molex connector for CN5, and flying leads at the other end*	3	2	**VW3 M8 201 R30**	0.040
		5	2	**VW3 M8 201 R50**	0.050

RS 422 interface accessories

Designation	Description	Length m	Reference	Weight kg
Splitter block for encoder signals *(RVA)*	For distributing A/B encoder signals or pulse/direction signals to five Lexium 05 servo drives. Includes a 24 V ⎓ / 5 V power supply for external encoder	–	**VW3 M3 101**	0.700
Cascading cable	For cascading two VW3 M3 101 *(RVA)* splitter blocks	0.5	**VW3 M8 211 R05**	–
RS 422 converter *(USIC)*	For adapting 24 V control signals to RS 422 standard	–	**VW3 M3 102**	–

VW3 M3 102 (USIC)

Equipped cables for RS 422 interface

From	To	Length m	Reference	Weight kg
Lexium 05 servo drive (encoder simulator)	VW3 M3 101 *(RVA)* for ESIM distribution	0.5	**VW3 M8 209 R05**	0.020
Splitter block VW3 M3 101 *(RVA)*	Lexium 05 servo drive, input CN5	1.5	**VW3 M8 209 R15**	0.030
Converter VW3 M3 102 *(USIC)*	Lexium 05 servo drive, input CN5 *Cables equipped with a 10-way Molex connector on the Lexium 05 side (CN5), and a 15-way SUB-D connector on the VW3 M3 10● side*	3	**VW3 M8 209 R30**	0.040
		5	**VW3 M8 209 R50**	0.050

(1) For other Modicon Premium connection cables, please consult our catalogue.

Note: *ESIM (Encoder SIMulation) designates encoder output signals simulated by the servo drives (available on Lexium 05 CN5, configured as output).*

Other connection cables

Description		Length m	Reference	Weight kg
Pulse/direction control cables	Siemens S5 IP 247 to Lexium 05	3	**VW3 M8 205 R30**	–
	Siemens S5 IP 267 to Lexium 05	3	**VW3 M8 206 R30**	–
	Siemens S7 FM 353 to Lexium 05 *Cables equipped with a 10-way Molex connector on the Lexium 05 side (CN5), and a 9-way SUB-D connector on the other end*	3	**VW3 M8 207 R30**	–
Encoder feedback cable	Lexium 05 to Siemens S7 FM 354 *Cable equipped with a 10-way Molex connector on the Lexium 05 side (CN5), and a 15-way SUB-D connector on the FM 354 side*	3	**VW3 M8 208 R30**	–
PLC to VW3 M3 102 cables *(USIC)*	For pulse/direction signals *Cable equipped with a 15-way SUB-D connector on the VW3 M3 102 (USIC) side, and flying leads at the other end*	0.5	**VW3 M8 210 R05**	–
		1.5	**VW3 M8 210 R15**	–
		3	**VW3 M8 210 R30**	–
		5	**VW3 M8 210 R50**	–

Lexium 05 motion control
Lexium 05 servo drives
Option: braking resistors

Braking resistors

Internal braking resistor

A braking resistor is built into the servo drive to absorb the braking energy. If the DC bus voltage in the servo drive exceeds a specified value, this braking resistor is activated. The restored energy is converted into heat by the braking resistor.

External braking resistor

An external braking resistor is necessary for applications in which the servo motor has to be braked frequently and the internal braking resistor cannot dissipate the excess braking energy.

If an external braking resistor is used, the internal braking resistor must be deactivated. To do this, the shunt between PA/+ and PBI must be removed and the external braking resistor connected between PA/+ and PBE (see page 41).

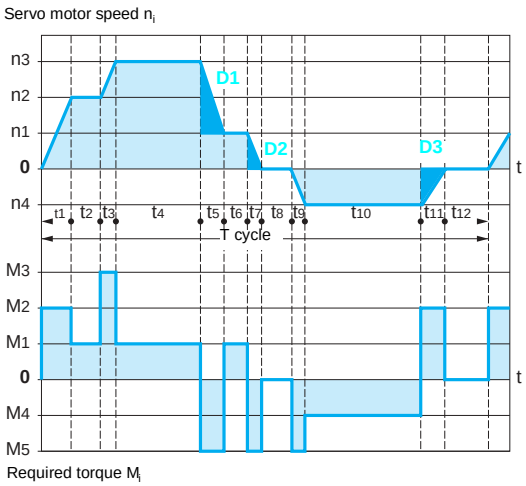
Two or more external braking resistors can be connected in parallel. The servo drive monitors the power dissipated in the braking resistor.

Sizing the braking resistor

During braking or deceleration requested by the servo drive, the kinetic energy of the moving load must be absorbed by the servo drive. The energy generated by deceleration charges the capacitors integrated in the servo drive. When the voltage at the capacitor terminals exceeds the permitted threshold, the braking resistor (internal or external) will be activated automatically in order to dissipate this energy. In order to calculate the power to be dissipated by the braking resistor, the user needs a knowledge of the timing diagram giving the servo motor torques and speeds as a function of time in order to identify the curve segments in which the servo drive decelerates the load.

Servo motor cycle timing diagram

These curves are the same as those used on page 92 for selecting the size of the servo motor. The curve segments to be taken into account, when the servo drive is decelerating, are marked in blue by D_i.



Sizing the braking resistor (continued)

Calculation of the constant deceleration energy

To do this, the user must know the total inertia, defined as follows:
J_t: Total inertia
where:
J_t = Jm (servo motor inertia) + Jc (load inertia). For Jm, see pages 56 to 78.
The energy E_i of each deceleration segment is defined as follows:

$$E_i = \frac{1}{2} J_t \cdot \omega_i^2 = \frac{1}{2} J_t \cdot \left(\frac{2\pi n_i}{60}\right)^2$$

Which gives the following for the various segments:

$$E_1 = \frac{1}{2} J_t \cdot \left(\frac{2\pi [n_3 - n_1]}{60}\right)^2$$

$$E_2 = \frac{1}{2} J_t \cdot \left(\frac{2\pi n_1}{60}\right)^2$$

$$E_3 = \frac{1}{2} J_t \cdot \left(\frac{2\pi n_4}{60}\right)^2$$

where E_i is in joules, J_t in kgm^2, ω in radians and n_i in rpm.

Energy absorbed by the internal capacitor

The energy absorption capacity of the servo drive Edrive (without using an internal or external braking resistor) is given for each servo drive on page 24.
In the remainder of the calculation, only take account of the D_i segments, for which the energy E_i is greater than the absorption capacities given in the table opposite.
This additional energy E_{Di} must be dissipated in the resistor (internal or external):
$E_{Di} = E_i$ - Edrive (in joules).

Calculation of the continuous power

The continuous power Pc is calculated for each machine cycle:

$$Pc = \frac{\Sigma E_{Di}}{Tcycle}$$

where Pc is in W, E_{Di} in joules and **T cycle** in s.

Selecting the braking resistor (internal or external)

Note: *This is a simplified selection method. In extreme applications, for example with vertical axes, this method is inadequate. In this case, please consult your Regional Sales Office.*

The selection is carried out in two steps:

1. The maximum energy during a braking procedure must be less than the peak energy that can be absorbed by the internal braking resistor: E_{Di} < EPk and the continuous power of the internal braking resistor must in turn not exceed: Pc < PPr. If these conditions are met, the internal braking resistor is adequate.
2. If one of the above conditions is not met, an external braking resistor must be used to satisfy these conditions.
   The value of the external braking resistor must be between the minimum and maximum values given in the table. Otherwise the servo drive may be subject to disturbance and the load will no longer be braked safely.

Lexium 05 motion control

Lexium 05 servo drives

Option: braking resistors

Characteristics

			LXM 05●	D10F1	D17F1	D28F1	D10M2	D17M2	D28M2	D10M3X	D17M3X	D42M3X
Supply voltage			**V**	115			230			230		
Number of phases				Single-phase						Three-phase		
Load threshold			**V** ⎓	250			430			430		
Energy absorption of the internal capacitors		Edrive	**Joule (Ws)**	10.8	16.2	26	17.7	26.6	43	17.7	26.6	43
Internal resistor	Resistance		Ω	40		10	40		20	40		20
	Continuous power	PPr	**W**	20	40	60	20	40	60	20	40	60
	Peak energy	EPk	**Joule (Ws)**	500		1000	900		1600	900		1600
External resistor	Min. resistance		Ω	27	20	10	50	27	16	50	27	10
	Max. resistance		Ω	45	27	20	75	45	27	75	45	20
	Degree of protection			IP 65								

			LXM 05●	D14N4		D22N4		D34N4		D57N4	
Supply voltage			**V**	400	480	400	480	400	480	400	480
Number of phases				Three-phase							
Load threshold			**V** ⎓	780							
Energy absorption of the internal capacitors		Edrive	**Joule (Ws)**	26	6	52	12	52	12	104	10
Internal resistor	Resistance		Ω	40		30				20	
	Continuous power	PPr	**W**	40		60				100	
	Peak energy	EPk	**Joule (Ws)**	1000		1600				2000	
External resistor	Min. resistance		Ω	60		25				10	
	Max. resistance		Ω	80		36				21	
	Degree of protection			IP 65							

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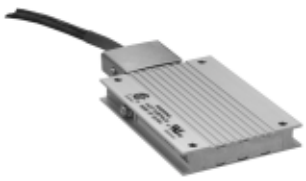
Lexium 05 motion control

Lexium 05 servo drives

Option: braking resistors



VW3 A7 60● R●●

References

External braking resistors

Value	Continuous power PPr	Peak energy EPk 115 V Ws	230 V Ws	400 V Ws	Length of connection cable	Reference	Weight
W	**W**				**m**		**kg**
10	400	18800	13300	–	0.75	**VW3 A7 601 R07**	1.420
					2	**VW3 A7 601 R20**	1.470
					3	**VW3 A7 601 R30**	1.620
27	100	4200	3800	1900	0.75	**VW3 A7 602 R07**	0.630
					2	**VW3 A7 602 R20**	0.780
					3	**VW3 A7 602 R30**	0.900
	200	9700	7400	4900	0.75	**VW3 A7 603 R07**	0.930
					2	**VW3 A7 603 R20**	1.080
					3.00	**VW3 A7 603 R30**	1.200
	400	25500	18100	11400	0.75	**VW3 A7 604 R07**	1.420
					2	**VW3 A7 604 R20**	1.470
					3	**VW3 A7 604 R30**	1.620
72	100	5500	3700	3000	0.75	**VW3 A7 605 R07**	0.620
					2	**VW3 A7 605 R20**	0.750
					3	**VW3 A7 605 R30**	0.850
	200	14600	9600	7600	0.75	**VW3 A7 606 R07**	0.930
					2	**VW3 A7 606 R20**	1.080
					3	**VW3 A7 606 R30**	1.200
	400	36500	24700	18300	0.75	**VW3 A7 607 R07**	1.420
					2	**VW3 A7 607 R20**	1.470
					3	**VW3 A7 607 R30**	1.620

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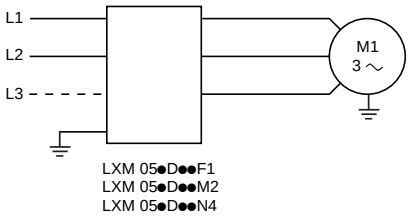
Lexium 05 motion control

Lexium 05 servo drives

Option: additional EMC input filters

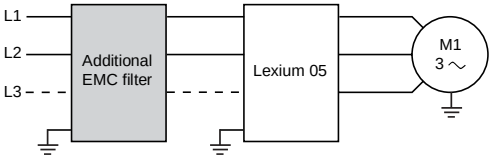


Integrated EMC input filter

Function

Lexium 05 LXM 05●D●●F1/M2/N4 servo drives have built-in radio interference input filters to comply with the EMC standard for variable speed electrical power drive "products" IEC/EN 61800-3, edition 2, category C3 in environment 2, and to comply with the European directive on EMC (electromagnetic compatibility).

For Lexium 05 servo drive	Maximum servo motor cable length according to EMC category IEC 61800-3, category C3 in environment 2 Switching frequency 4 kHz (default) m
Single-phase supply voltage	
LXM 05AD10F1	10
LXM 05AD10M2	10
LXM 05AD17F1	10
LXM 05AD17M2	10
LXM 05AD28F1	10
LXM 05AD28M2	10
Three-phase supply voltage	
LXM 05AD14N4	10
LXM 05AD22N4	10
LXM 05AD34N4	10
LXM 05AD57N4	10



Additional EMC input filters

Applications

Additional filters can be used to meet more stringent requirements: these filters are designed to reduce conducted emissions on the line supply below the limits of standard IEC 61800-3 edition 2 categories C2 and C3. These additional filters are mounted either underneath the Lexium 05 servo drives, or to the side of the product. They act as a support for the drives and are attached to them via tapped holes.

For servo drives that are not equipped with an EMC filter, reference LXM 05●D●●M3X, an additional EMC filter must be provided.

Use according to the type of line supply

These built-in or additional filters can only be used on TN (neutral connection) and TT (neutral to earth) type supplies.

The filters must not be used on IT (impedance or isolated neutral) type supplies. For LXM 05●D●●F1/M2/N4 servo drives with integrated filter, the filter must be disconnected using the selector switch on the servo drive (see page 45).

Standard IEC/EN 61800-3, appendix D2.1, states that on IT (isolated or impedance earthed neutral) type supplies, filters can adversely affect the operation of the insulation monitors. In addition, the effectiveness of additional filters on this type of line supply depends on the type of impedance between neutral and earth, and therefore cannot be predicted.

Note: *If a machine is to be installed on an IT supply, one solution is to insert an isolation transformer in order to re-create a TT system on the secondary side.*

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Lexium 05 motion control

Lexium 05 servo drives

Option: additional EMC input filters

Characteristics of servo drive/EMC filter mounting

Conformity to standards			EN 133200
Degree of protection			IP 41 on the upper part with protective cover in place IP 20 after removal of the protective cover (see page 48)
Relative humidity			According to IEC 60721-3-3, class 3K3, 5% to 85%, without condensation or dripping water
Ambient temperature around the device	Operation	**°C**	- 10…+ 50
	Storage	**°C**	- 25…+ 70
Altitude		**m**	1000 m without derating Up to 2000 m under the following conditions: ■ Max. temperature 40°C ■ Mounting distance between servo drives > 50 mm ■ Removal of the protective cover
Vibration resistance	Conforming to IEC 60068-2-6		10 Hz to 57 Hz: amplitude 0.075 mm 57 Hz to 150 Hz: 1 g
Shock resistance	Conforming to IEC 60068-2-27		15 gn for 11 ms
Maximum nominal voltage	Single-phase 50/60 Hz	**V**	120 + 10% 240 + 10%
	Three-phase 50/60 Hz	**V**	240 + 10% 480 + 10%

Application, category: EN 61800-3: 2001-02; IEC 61800-3, Ed. 2	**Description**
Category C2 in environment 1	Restricted distribution, for domestic use, sale conditioned by the competence of the user and the distributor on the subject of EMC compatibility
Category C3 in environment 2	Use in industrial premises

References

535765

VW3 A31402

Additional EMC input filters

For Lexium 05 servo drive	Maximum servo motor cable length according to EMC category, IEC 61800-3			Reference	Weight
	Category C2 in environment 2	Category C3 in environment 2			
	Switching frequency 4 kHz (default)	Switching frequency 4 kHz (default)	Switching frequency 8 kHz		
	m	m	m		kg
Single-phase supply voltage					
LXM 05●D10F1 **LXM 05●D10M2**	20	40	100	**VW3 A31401**	0.600
LXM 05●D17F1 **LXM 05●D17M2**	20	40	100	**VW3 A31403**	0.775
LXM 05●D28F1 **LXM 05●D28M2**	20	40	100	**VW3 A31405**	1.130
Three-phase supply voltage					
LXM 05●D10M3X	20	40	100	**VW3 A31402**	0.550
LXM 05●D17M3X **LXM 05●D14N4**	20	40	100	**VW3 A31404**	0.900
LXM 05●D42M3X **LXM 05●D22N4** **LXM 05●D34N4**	20	40	100	**VW3 A31406**	1.350
LXM 05●D57N4	20	40	100	**VW3 A31407**	3.150

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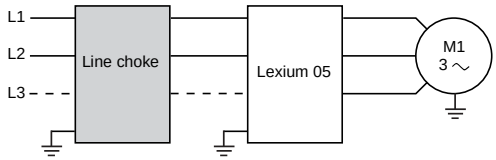
Lexium 05 motion control
Lexium 05 servo drives
Option: line chokes

Line chokes



A line choke is used to provide improved protection against overvoltages on the line supply and to reduce the current harmonics produced by the servo drive.

The recommended chokes limit the line current.
They have been developed in line with standard EN 50178 (VDE 0160 level 1 high energy overvoltages on the line supply).

The inductance values are defined for a voltage drop of between 3% and 5% of the nominal line voltage. Values higher than this will cause loss of torque.
These chokes must be installed upstream of the servo drive.

A number of servo drives can be used on one line choke. The current consumption of all the servo drives must not exceed the nominal current of the line choke (at nominal voltage).

Applications

The use of line chokes is recommended in particular under the following circumstances:
- Close connection of several servo drives in parallel
- Line supply with significant disturbance from other equipment (interference, overvoltages)
- Line supply with voltage imbalance between phases greater than 1.8% of the nominal voltage
- Servo drive supplied by a line with very low impedance (in the vicinity of a power transformer 10 times more powerful than the servo drive rating)
- Installation of a large number of servo drives on the same line
- Reduction of overloads on the cos φ correction capacitors, if the installation includes a power factor correction unit

General characteristics

Type of line choke			VZ1 L007UM50	VZ1 L018UM20	VW3 A4 551	VW3 A4 552	VW3A4 553
Conformity to standards			EN 50178 (VDE 0160 level 1 high energy overvoltages on the line supply)				
Voltage drop			Between 3% and 5% of the nominal supply voltage. Values higher than this will cause loss of torque				
Degree of protection	Choke		IP 00				
	Terminals		IP 20				
Inductance value		**mH**	5	2	10	4	2
Nominal current		**A**	7	18	4	10	16
Losses		**W**	20	30	45	65	75

References

VW3 A4 55●

Line chokes

For LXM 05● servo drive	Line current without choke		Line current with choke		Reference	Weight
	U min.	U max.	U min.	U max.		
	A	A	A	A		kg
Single-phase supply voltage: 100…120 V 50/60 Hz *(1)*						
D10F1	7.6	7.0	5.9	5.4	**VZ1L007UM50**	0.880
D17F1	11.5	10.5	9.7	8.9	**VZ1L018UM20**	1.990
D28F1	15.7	14.4	13.3	12.2		
Single-phase supply voltage: 200…240 V 50/60 Hz *(1)*						
D10M2	8.1	6.7	6.3	5.3	**VZ1L007UM50**	0.880
D17M2	12.7	10.5	10.7	8.9	**VZ1L018UM20**	1.990
D28M2	23.0	19.2	20.2	16.8		
Three-phase supply voltage: 200…240 V 50/60 Hz *(1)*						
D10M3X	5.2	4.2	2.7	2.2	**VW3 A4 551**	1.500
D17M3X	9.0	7.5	5.2	4.3	**VW3 A4 552**	3.000
D42M3X	19.0	15.8	12.2	10.2	**VW3 A4 553**	3.500
Three-phase supply voltage: 380…480 V 50/60 Hz *(1)*						
D10N4	4.2	3.3	2.2	1.8	**VW3 A4 551**	1.500
D22N4	6.3	5.0	3.4	2.7		
D34N4	9.7	7.7	5.8	4.6	**VW3 A4 552**	3.500
D57N4	17.7	14.0	9.8	7.8		

(1) Nominal supply voltage: U min…U max.

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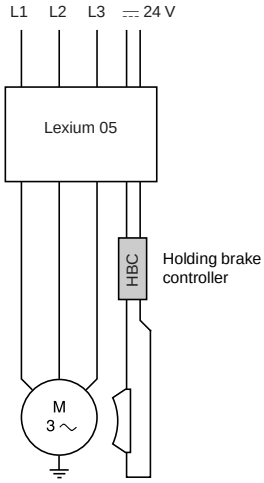
Lexium 05 motion control

Lexium 05 servo drives
Option: holding brake controller

Holding brake controller



If a servo motor has a holding brake, it must be given an appropriate control logic (HBC, *Holding Brake Controller*), which releases the brake when power is supplied to the servo motor and immobilizes the servo motor shaft when it is stationary.

The holding brake controller amplifies the braking control signal transmitted by the Lexium 05 servo drives, so that the brake is deactivated quickly, then reduces the brake control power so as to decrease the dissipated heat.

Characteristics

Mounting on rail				⎍ 55
Degree of protection				IP 20
Supply voltage			**V**	19.2…30
Input current			**A**	0.5 A + brake nominal current
Brake output	Voltages	Before power reduction	**V**	⎓ 23…25
		After power reduction	**V**	⎓ 17…19
	Maximum current		**A**	1.6
	Time before voltage reduction		**ms**	1000

Note: *Electrical isolation between the 24 V power supply, the control input and the brake control output.*

Reference

VW3 M3 103

Holding brake controller

Designation	Description	Reference	Weight kg
Holding brake controller	⎓ 24 V power supply Max. power 50 W IP 20, for mounting on 55 mm ⎍ rail	**VW3 M3 103**	0.600

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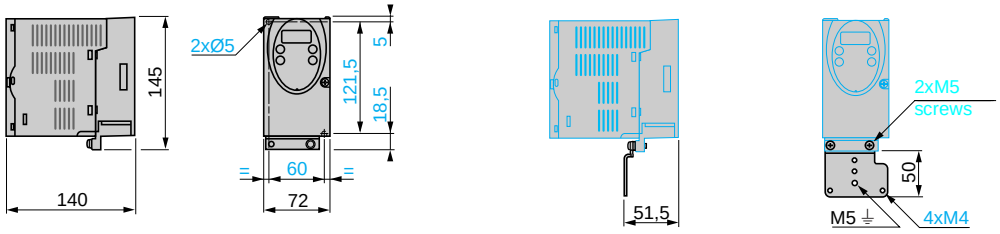
Lexium 05 motion control
Lexium 05 servo drives

Dimensions

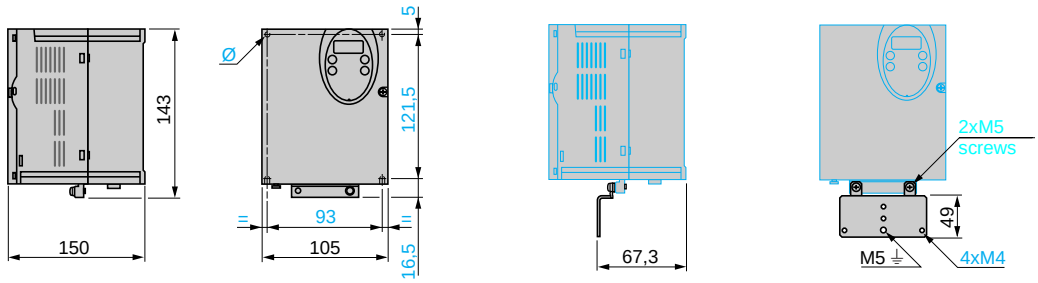
LXM 05●D10F1, LXM 05●D10M2, LXM 05●D10M3X

EMC mounting plate (supplied with servo drive)



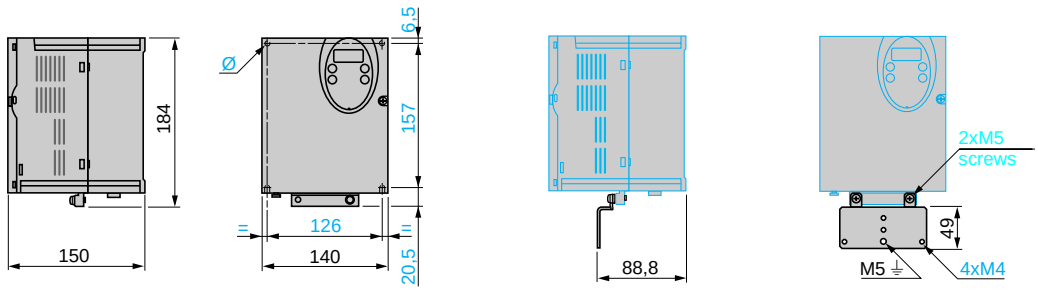
LXM 05●D17F1, LXM 05●D17M2, LXM 05●D14N4, LXM 05●D17M3X

EMC mounting plate (supplied with servo drive)



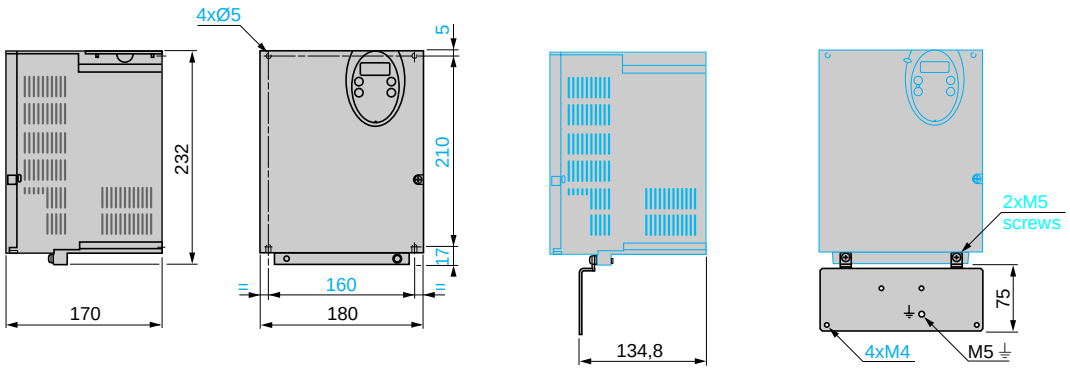
LXM 05●D28F1, LXM 05●D28M2, LXM 05●D34N4, LXM 05●D42M3X

EMC mounting plate (supplied with servo drive)



LXM 05●D57N4

EMC mounting plate (supplied with servo drive)



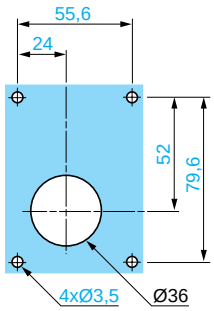
Lexium 05 motion control

Options: remote display terminal, plates for mounting on ⊓ rail and braking resistors

Dimensions (continued)

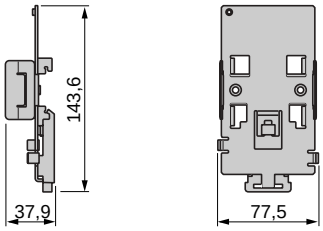
Remote display terminal

VW3 A31101

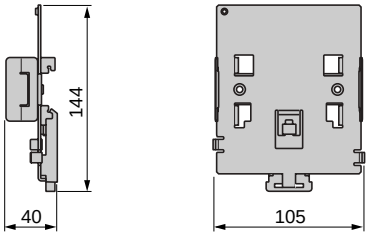


Plates for mounting on ⊓ rail

VW3 A11851

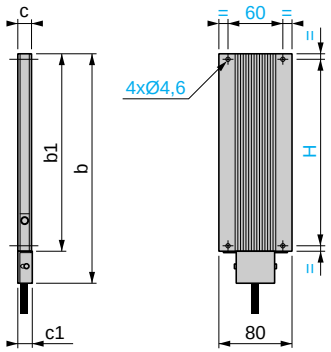


VW3 A31852



Braking resistors

VW3 A7 60● R●●



VW3	b	b1	c	c1	H
A7 602, 605	145	110	15	15.5	98
A7 603, 606	251	216	15	15.5	204
A7 601, 604, 607	257	216	30	–	204

Characteristics: page 24
References: pages 17 and 25
Schemes: page 41

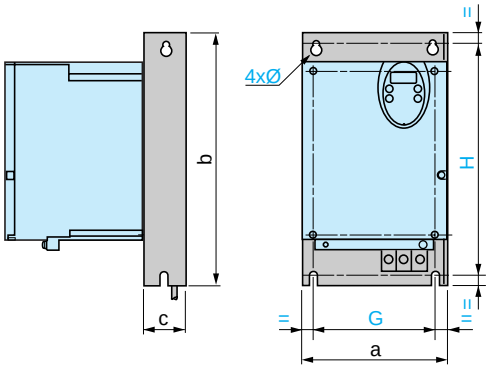
Lexium 05 motion control

Options: additional EMC input filters and line chokes

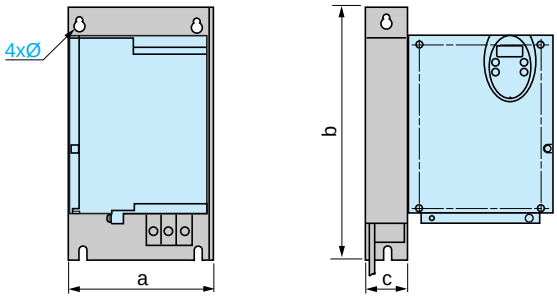
Dimensions (continued)

Additional EMC input filters

Mounting the filter under the servo drive



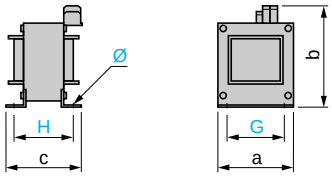
Mounting the filter next to the servo drive



VW3	a	b	c	G	H	Ø
A31401, A31402	72	195	37	52	180	M4
A31403	107	195	35	85	180	M4
A31404	107	195	42	85	180	M4
A31405	140	235	35	120	215	M4
A31406	140	235	50	120	215	M4
A31407	180	305	60	140	285	M4

Single-phase line chokes

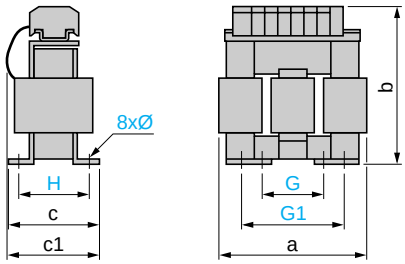
VZ1 L0●●●UM●0



VZ1	a	b	c	G	H	Ø
L007UM50	60	100	95	50	60	4 x 9
L018UM20	85	120	105	70	70	5 x 11

Three-phase line chokes

VW3 A4 55●



VW3	a	b	c	c1	G	G1	H	Ø
A4 551	100	135	55	60	40	60	42	6 x 9
A4 552	130	155	85	90	60	80.5	62	6 x 12
A4 553	130	155	85	90	60	80.5	62	6 x 12

Presentation: pages 26 and 28
References: pages 27 and 28
Schemes: page 41

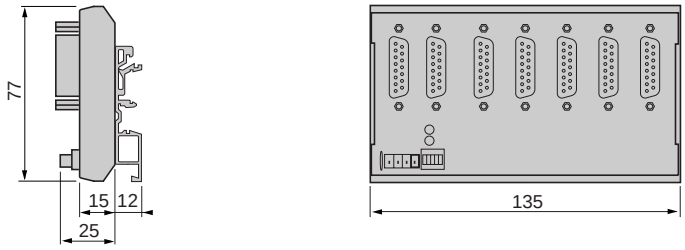
Lexium 05 motion control

Options: splitter block, USIC and holding brake controller

Dimensions (continued)

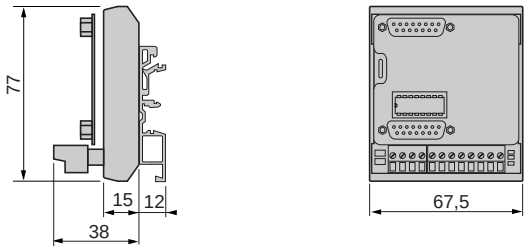
Splitter block

VW3 M3 101



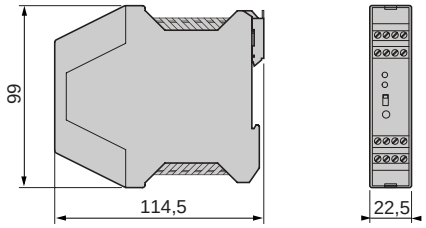
RS 422 converter (USIC)

VW3 M3 102



Holding brake controller

VW3 M3 103



References:
pages 20 and 29

Schemes:
page 41

Lexium 05 motion control
Lexium 05 servo drives
Safety requirements

“Power Removal” safety function

The Lexium 05 servo drive integrates the “Power Removal” safety function which prevents unintended operation of the servo motor. The servo motor no longer produces any torque.

This safety function:
- Complies with the standard for safety of machinery EN 954-1, category 3
- Complies with the standard for functional safety IEC/EN 61508, SIL2 capability (safety control-signalling applied to processes and systems)

The SIL (Safety Integrity Level) capability depends on the connection diagram for the servo drive and for the safety function. Failure to observe the setup recommendations could inhibit the SIL capability of the “Power Removal” safety function.
- Complies with draft product standard IEC/EN 61800-5-2 for both stop functions:
  - Safe Torque Off (“STO”)
  - Safe Stop 1 (“SS1”)

The “Power Removal” safety function has a redundant electronic architecture *(1)* which is monitored continuously by a diagnostics function.

This level SIL2 and category 3 safety function is certified as conforming to these standards by the TUV certification body in the context of a voluntary certification program.

Categories relating to safety according to EN 954-1

Category	Basic safety principle	Control system requirements	Behaviour in the event of a fault
B	Selection of components that conform to relevant standards	Control according to good engineering practice	Possible loss of the safety function
1	Selecting components and safety principles	Use of tried and tested components and proven safety principles	Possible loss of the safety function with a lower probability than in **B**
2	Selecting components and safety principles	Cyclic testing. The intervals between tests must be appropriate to both the machine and its application	Fault detected at each test
3	Structure of the safety circuits	A single fault must not result in loss of the safety function. The fault must be detected if this is reasonably possible	Safety function ensured, except in the event of an accumulation of faults
4	Structure of the safety circuits	A single fault must not result in loss of the safety function. The fault must be detected when or before the safety function is next invoked. An accumulation of faults must not result in loss of the safety function.	Safety function always ensured

The machinery manufacturer is responsible for selecting the safety category. The category depends on the level of risk factors given in standard EN 954-1.

Safety Integrity Levels (SIL) according to standard IEC/EN 61508

SIL1 according to standard IEC/EN 61508 is comparable to category 1 according to EN 954-1 (SIL1: mean probability of undetected hazardous failure per hour between 10^{-5} and 10^{-6}).
SIL2 according to standard IEC/EN 61508 is comparable to category 3 according to EN 954-1 (SIL2: mean probability of undetected hazardous failure per hour between 10^{-6} and 10^{-7}).

(1) Redundant: Consists of mitigating the effects of the failure of one component by means of the correct operation of another, assuming that faults do not occur simultaneously on both.

"Power Removal" safety function considerations

The "Power Removal" safety function cannot be considered as a means of electrical disconnection of the servo motor (no electrical isolation); if necessary, a Vario switch disconnector must be used.
The "Power Removal" safety function is not designed to compensate for any malfunction in the servo drive process control or application functions.
The output signals available on the servo drive must not be considered as safety-related signals (e.g. "Power Removal" active); these are Preventa-type safety module outputs which must be integrated into a safety control-signalling circuit.

The schemes on the following pages take into account conformity with standard IEC/EN 60204-1 which defines three stopping categories:
- Category 0: Stopping by immediate removal of the power from the actuators (e.g. uncontrolled stop)
- Category 1: Controlled stop maintaining the power on the actuators until the machine stops, then removal of the power when the actuators stop when the machine stops
- Category 2: Controlled stop maintaining the power on the actuators

Connection diagrams and applications

Conformity to category 1 of standard EN 954-1 and level SIL1 according to standard IEC/EN 61508

Use of the connection diagrams on page 36, which use a line contactor or a Vario switch disconnector between the servo drive and the servo motor: In this case, the "Power Removal" safety function is not used and the servo motor stops in accordance with **category 0** of standard IEC/EN 60204-1.

Conformity to category 3 of standard EN 954-1 and level SIL2 according to standard IEC/EN 61508

The connection diagrams use the "Power Removal" safety function of the Lexium 05 servo drive combined with a Preventa safety module to monitor the emergency stop circuits.

Machines with short freewheel stopping times (low inertia or high resistive torque, see page 37).
When the activation command is given on the $\overline{\text{PWRR_A}}$ and $\overline{\text{PWRR_B}}$ inputs with the controlled servo motor, the servo motor power supply is cut immediately and the servo motor stops according to **category 0** of standard IEC/EN 60204-1.
Restarting is not permitted even when the activation command is given after the servo motor has come to a complete stop.
This safe stop is maintained as long as the $\overline{\text{PWRR_A}}$ and $\overline{\text{PWRR_B}}$ inputs remain activated.

This diagram must also be used for hoisting applications.
On a "Power Removal" command, the servo drive requires the brake to be engaged, but a Preventa safety module contact must be inserted in series in the brake control circuit to engage it safely when a request is made to activate the "Power Removal" safety function.

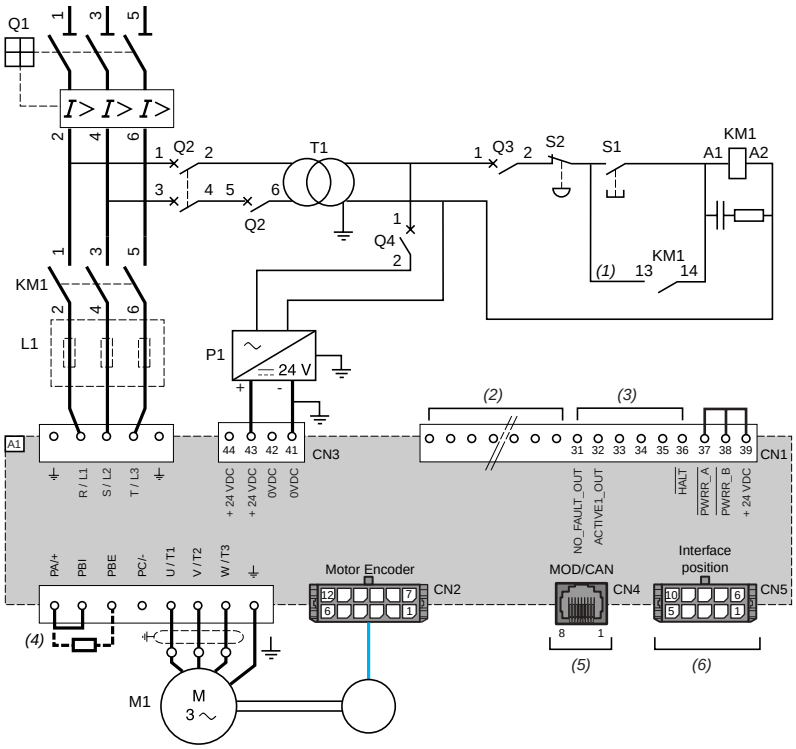
Machines with long freewheel stopping times (high inertia or low resistive torque, see pages 38 and 39).
When the activation command is given, deceleration of the servo motor controlled by the servo drive is first requested, then, following a time delay controlled by an XPS AV (Preventa-type) fault relay which corresponds to the deceleration time, the "Power Removal" safety function is activated by the $\overline{\text{PWRR_A}}$ and $\overline{\text{PWRR_B}}$ inputs.
The servo motor stops according to **category 1** of standard IEC/EN 60204-1 ("SS1").

***Note: Periodic test**: The "Power Removal" safety input must be activated at least once a year for preventive maintenance purposes. The servo drive must be switched off before preventive maintenance is carried out, and then powered up again. If the power supply to the servo motor is not switched off during testing, safety integrity is no longer assured for the "Power Removal" safety function. The servo drive must therefore be replaced to ensure the operational safety of the machine or the system process.*

Schemes conforming to standards EN 954-1 category 1, IEC/EN 61508 SIL1 capability, in stopping category 0 according to IEC/EN 60204-1

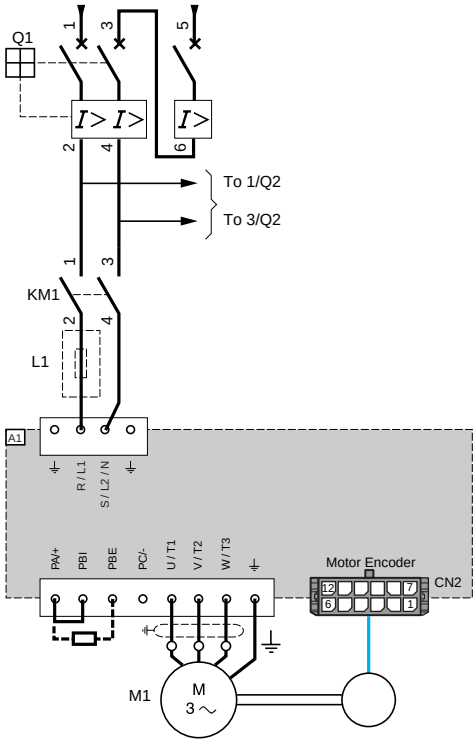
LXM 05●D●●M3X, LXM 05●D●●N4

Three phase power supply with upstream breaking via contactor



LXM 05●D●●F1, LXM 05●D●●M2

Power section for single phase power supply



Note: *All terminals are located at the bottom of the servo drive. Fit interference suppressors to all inductive circuits near the servo drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.*

Compatible components
(for a complete list of references, please consult our “Motor starter solutions - Control and protection components" catalogue).

Ref.	Description
A1	Lexium 05 servo drive, see page 16
KM1	Line contactor, see motor starters on pages 46 and 47
L1	Line choke, see page 28
M1	BSH servo motor, see pages 80 and 81
P1	Phaseo (SELV) power supply ⎓ 24 V, please consult our “Interfaces, I/O splitter boxes and power supplies” catalogue
Q1	Circuit-breaker, see motor starters on pages 46 and 47
Q2	GV2 L magnetic circuit-breaker rated at twice the nominal primary current of T1
Q3, Q4	GB2 CB05 thermal magnetic circuit-breaker
S1, S2	XB4 B or XB5 A “Start” and “Emergency stop” pushbuttons
T1	220 V secondary transformer

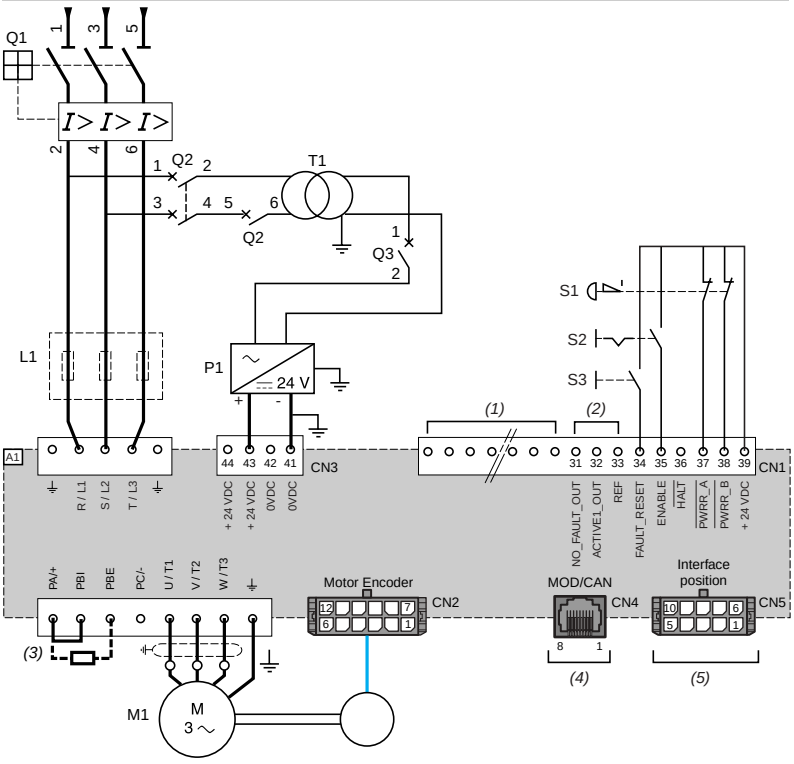
(1) Insert (in series) a contact of the relay controlled by the “NO_FAULT_OUT” *(31) logic output: On a servo drive fault, KM1 (line contactor) opens.*
(2) Specific spring terminals according to the type of servo drive (see page 42)
(3) 4 logic inputs and 2 logic outputs ⎓ 24 V (see page 42)
(4) External braking resistor (see page 25)
(5) CANopen bus or Modbus serial link on RJ45 connector. Can also be used to connect a PC terminal (equipped with PowerSuite software workshop) or the remote terminal VW3 A31101.
(6) Molex connector for connecting A/B encoder signals or pulse/direction signals (see page 44)

Schemes conforming to standards EN 954-1 category 3, IEC/EN 61508 SIL2 capability, in stopping category 0 according to IEC/EN 60204-1

The diagram below is shown in local control mode via logic I/O. In communication network control mode, the inputs marked 34 and 35 on the CN1 spring terminals must be controlled via the network. In this network mode, inputs 34 and 35 have the assignments “$\overline{\text{LIMN}}$” and “$\overline{\text{LIMP}}$”.

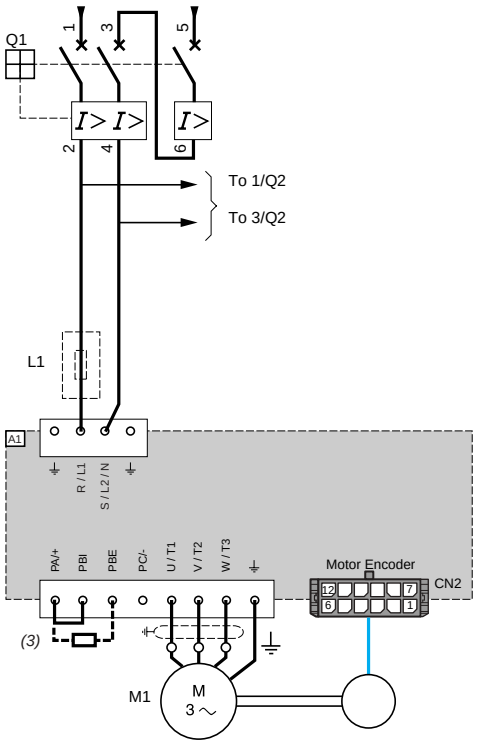
LXM 05●D●●M3X, LXM 05●D●●N4

Three phase power supply, low inertia machine, vertical movement



LXM 05●D●●F1, LXM 05●D●●M2

Power section for single phase power supply



Note: *All terminals are located at the bottom of the servo drive. Fit interference suppressors to all inductive circuits near the servo drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.*

Compatible components
(for the complete list of references, please consult our “Motor starter solutions - Control and protection components" catalogue).

Ref.	Description
A1	Lexium 05 servo drive, see page 16
L1	Line choke, see page 28
M1	BSH servo motor, see pages 80 and 81
P1	Phaseo (SELV) power supply ⎓ 24 V, please consult our “Interfaces, I/O splitter boxes and power supplies” catalogue
Q1	Circuit-breaker, see motor starters on pages 46 and 47
Q2	GV2 L magnetic circuit-breaker rated at twice the nominal primary current of T1
Q3	GB2 CB05 thermal magnetic circuit-breaker
S1	XB4 B or XB5 A “Emergency stop” dual contact pushbutton
S2	XB4 B or XB5 A “Enable” stay-put pushbutton
S3	XB4 B or XB5 A “Reset” pushbutton
T1	220 V secondary transformer

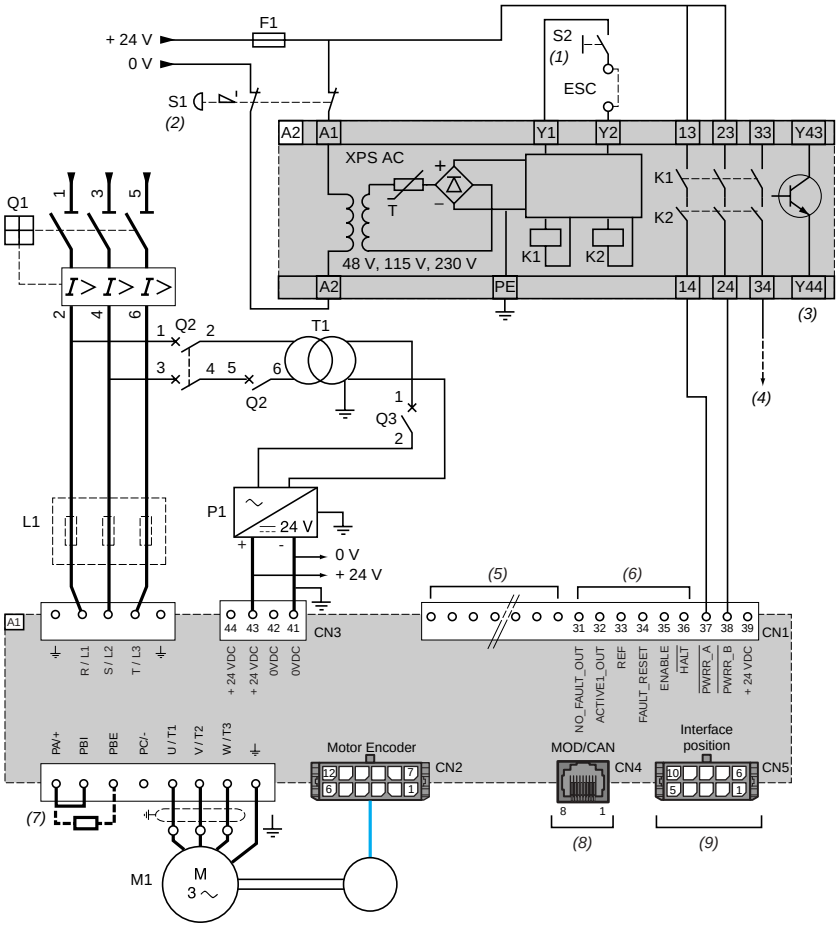
(1) Specific spring terminals according to the type of servo drive (see page 42)
(2) 1 logic input and 2 logic outputs ⎓ 24 V (see page 42)
(3) External braking resistor (see page 25)
(4) CANopen bus or Modbus serial link on RJ45 connector. Can also be used to connect a PC terminal (equipped with PowerSuite software workshop) or the remote terminal VW3 A31101.
(5) Molex connector for connecting A/B encoder signals or pulse/direction signals (see page 44)

Schemes conforming to standards EN 954-1 category 3, IEC/EN 61508 SIL2 capability, in stopping category 0 according to IEC/EN 60204-1 (continued)

The diagram below is shown in local control mode via logic I/O. In communication network control mode, the inputs marked 34 and 35 on the CN1 spring terminals must be controlled via the network. In this network mode, inputs 34 and 35 have the assignments “$\overline{\text{LIMN}}$” and “$\overline{\text{LIMP}}$”.

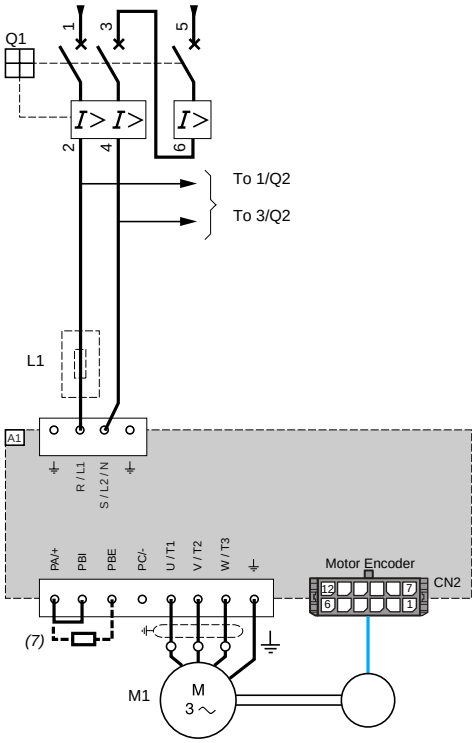
LXM 05●D●●M3X, LXM 05●D●●N4

Three phase power supply, low inertia machine, vertical movement



LXM 05●D●●F1, LXM 05●D●●M2

Power section for single phase power supply



Note: *All terminals are located at the bottom of the servo drive. Fit interference suppressors to all inductive circuits near the servo drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.*

Compatible components (for a complete list of references, please consult our “Motor starter solutions. Control and protection components” and “Safety solutions using Preventa” catalogues).

Ref.	Description
A1	Lexium 05 servo drive, see page 16
A2	Preventa XPS AC safety module for monitoring emergency stops and switches. The XPS AC safety module can manage the “Power Removal” function of several servo drives on the same machine.
F1	Fuse
L1	Line choke, see page 28
M1	BSH servo motor, see pages 80 and 81
P1	Phaseo (SELV) power supply ⎓ 24 V, please consult our “Interfaces, I/O splitter boxes and power supplies” catalogue
Q1	Circuit-breaker, see motor starters on pages 46 and 47
Q2	GV2 L magnetic circuit-breaker rated at twice the nominal primary current of T1
Q3	GB2 CB05 thermal magnetic circuit-breaker
S1	XB4 B or XB5 A “Emergency stop” pushbutton with 2 contacts
S2	XB4 B or XB5 A spring return pushbutton
T1	220 V secondary transformer

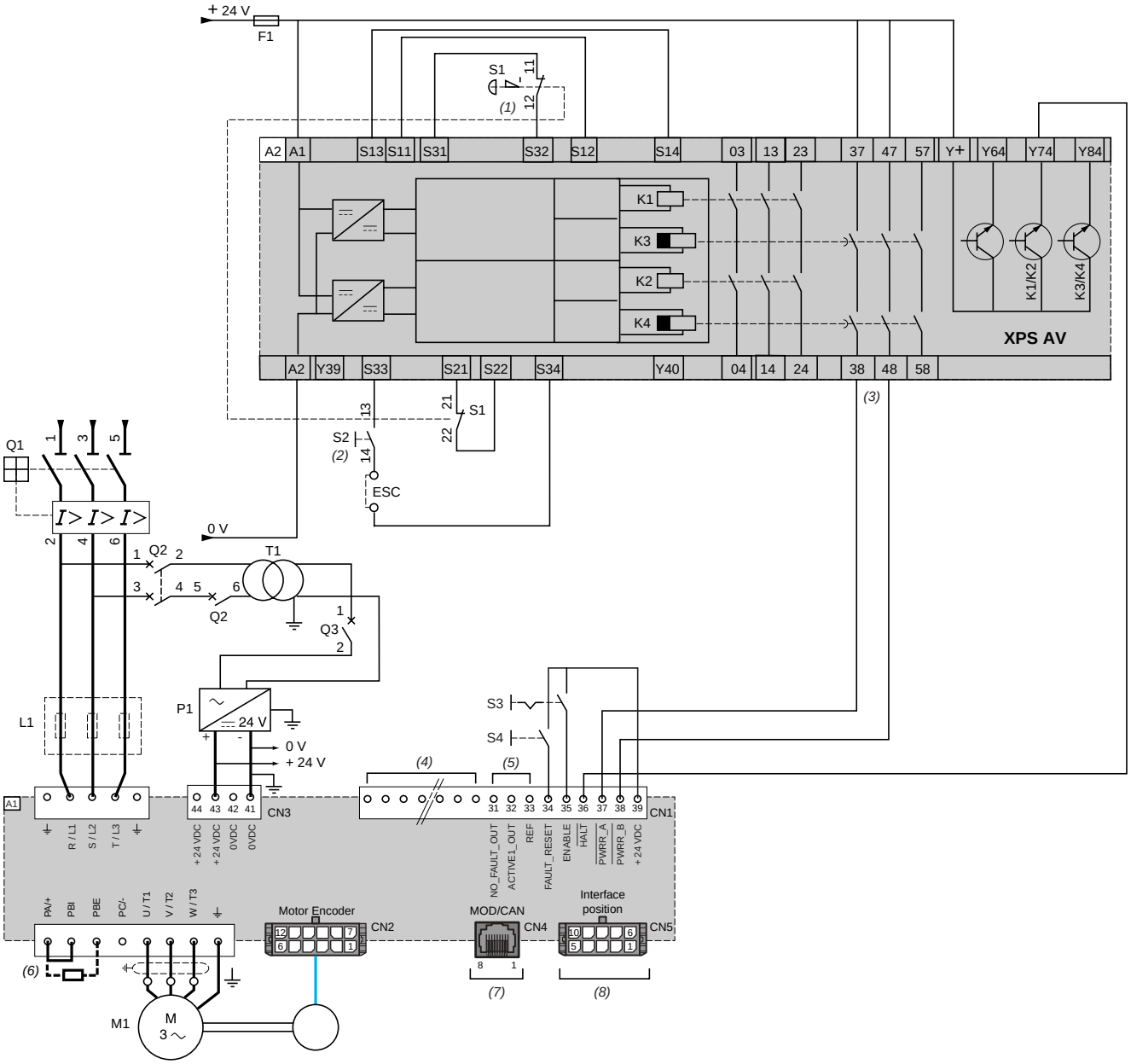
(1) S2: Resets the XPS AC module on power-up or after an emergency stop. ESC can be used to set external starting conditions.
(2) S1: Requests uncontrolled stopping of the movement and activates the “Power Removal” safety function.
(3) The logic output can be used to indicate that the machine is in a safe stop state.
(4) To “Power Removal” safety function of an Altivar 71 variable speed servo drive (for example).
(5) Specific spring terminals according to the type of servo drive (see page 42)
(6) 4 logic inputs and 2 logic outputs ⎓ 24 V (see page 42)
(7) External braking resistor (see page 25)
(8) CANopen bus or Modbus serial link on RJ45 connector. Can also be used to connect a PC terminal (equipped with PowerSuite software workshop) or the remote terminal VW3 A31101.
(9) Molex connector for connecting A/B encoder signals or pulse/direction signals (see page 44)

Schemes conforming to standards EN 954-1 category 3, IEC/EN 61508 SIL2 capability, in stopping category 1 according to IEC/EN 60204-1

The diagram below is shown in local control mode via logic I/O. In communication network control mode, the inputs marked 34 and 35 on the CN1 spring terminals must be controlled via the network. In this network mode, inputs 34 and 35 have the assignments “LIMN” and “LIMP”.

LXM 05●D●●M3X, LXM 05●D●●N4

Three phase power supply, high inertia machine



Note: *All terminals are located at the bottom of the servo drive. Fit interference suppressors to all inductive circuits near the servo drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.*

Compatible components (see page 40)

(1) S1: Requests controlled stopping of the movement and activates the “Power Removal” safety function.
(2) S2: Resets the XPS AT module on power-up or after an emergency stop. ESC can be used to set external starting conditions.
(3) Time-delayed opening safety outputs, 300 seconds max. (stopping category 1)
(4) Specific spring terminals according to the type of servo drive(see page 42)
(5) 1 logic input and 2 logic outputs ⎓ 24 V (see page 42)
(6) External braking resistor (see page 25)
(7) CANopen bus or Modbus serial link on RJ45 connector. Can also be used to connect a PC terminal (equipped with PowerSuite software workshop) or the remote terminal VW3 A31101.
(8) Molex connector for connecting A/B encoder signals or pulse/direction signals (see page 44)

Schemes conforming to standards EN 954-1 category 3, IEC/EN 61508 SIL2 capability, in stopping category 1 according to IEC/EN 60204-1 (continued)

LXM 05●D●●M3X, LXM 05●D●●N4

Three phase power supply, high inertia machine (continued)

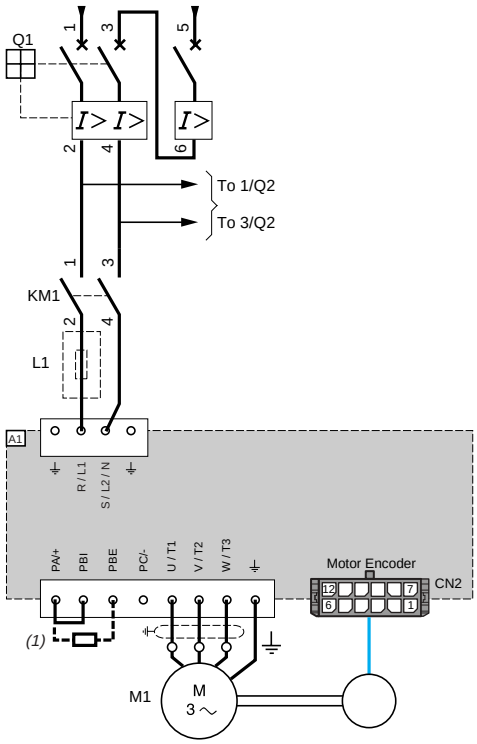
Compatible components (for a complete list of references, please consult our “Motor starter solutions. Control and protection components” and “Safety solutions using Preventa” catalogues).

Ref.	Description
A1	Lexium 05 servo drive, see page 16
A2 *(1)*	Preventa XPS AV safety module for monitoring emergency stops and switches. One safety module can manage the “Power Removal” function for several drives on the same machine, but the time delay must be adjusted on the servo drive controlling the servo motor that requires the longest stopping time.
F1	Fuse
L1	Line choke, see page 28
M1	Lexium BSH AC servo motor, see pages 80 and 81
P1	Phaseo (SELV) power supply ⎓ 24 V, please consult our “Interfaces, I/O splitter boxes and power supplies” catalogue
Q1	Circuit-breaker, see motor starters on pages 46 and 47
Q2	GV2 L magnetic circuit-breaker rated at twice the nominal primary current of T1
Q3	GB2 CB05 thermal magnetic circuit-breaker
S1	XB4 B or XB5 A “Emergency stop” dual contact pushbutton
S2	XB4 B or XB5 A “Start” pushbutton
S3	XB4 B or XB5 A “Enable” stay-put pushbutton
S4	XB4 B or XB5 A “Reset” pushbutton
T1	220 V secondary transformer

(1) For stopping times requiring more than 30 seconds in category 1, use a Preventa XPS AV safety module which can provide a maximum time delay of 300 seconds.

LXM 05●D●●F1, LXM 05●D●●M2

Power section for single phase power supply, high inertia machine



Note: *All terminals are located at the bottom of the servo drive. Fit interference suppressors to all inductive circuits near the servo drive or connected in the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.*

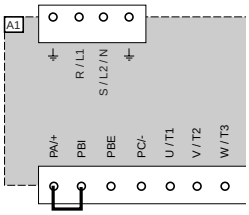
Compatible components (for a complete list of references, please consult our “Motor starter solutions. Control and protection components” and “Safety solutions using Preventa” catalogues).

Ref.	Description
A1	Lexium 05 servo drive, see page 16
L1	Line choke, see page 28
M1	Lexium BSH AC servo motor, see pages 80 and 81
Q1	Circuit-breaker, see motor starters on pages 46 and 47
Q2	GV2 L magnetic circuit-breaker rated at twice the nominal primary current of T1

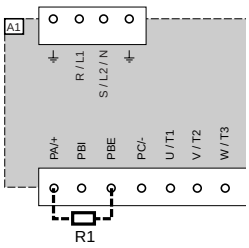
(1) External braking resistor (see page 25)

Braking resistor

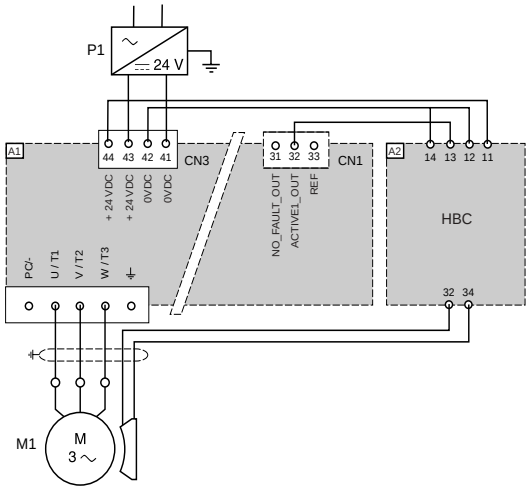
Internal resistor



External resistor



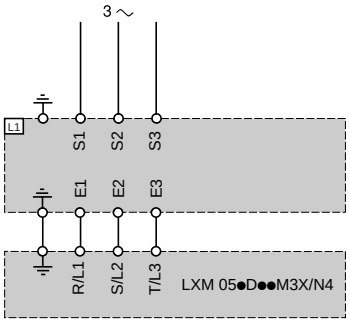
Holding brake controller



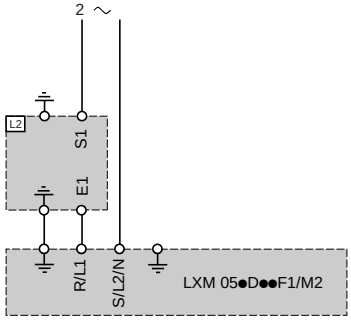
Compatible components	
Ref.	**Description**
A1	Lexium 05 servo drive, see page 16
A2	Holding brake controller VW3 M3103, see page 29
M1	BSH servo motor with holding brake, see pages 80 and 81
P1	Phaseo (SELV) power supply ⎓ 24 V, please consult our “Interfaces, I/O splitter boxes and power supplies” catalogue
R1	External braking resistor VW3 A7 60●R●●, see page 25

Line chokes

Three phase power supply VW3 A4 552/553/554



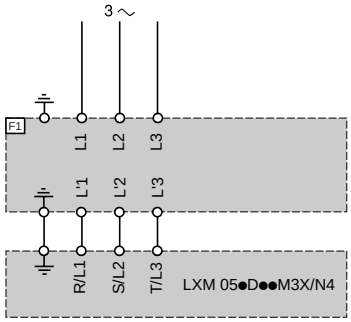
Single phase power supply VZ1L0●●UM●0



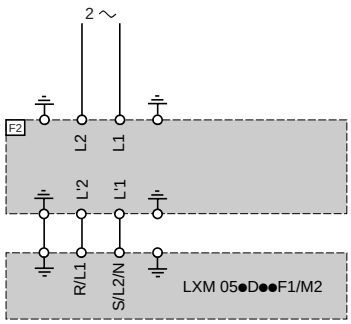
Compatible components	
Ref.	**Description**
L1	Three phase line choke VW3 A4 552/553/554, see page 28
L2	Single phase line choke VZ1L0●●UM●0, see page 28

Additional EMC input filters VW3 A3140●

Three phase power supply



Single phase power supply



Compatible components	
Ref.	**Description**
F1	Three phase additional EMC input filter VW3 A31402/404/406/407, see page 27
F2	Single phase additional EMC input filter VW3 A31401/403/405, see page 27

Note: *The additional EMC input filters are connected as close as possible to the servo drive, directly upstream of the drive.*

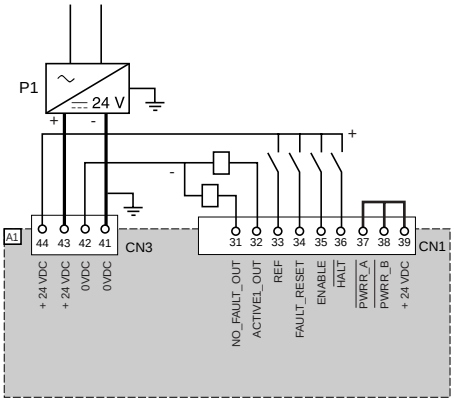
Logic I/O

The servo drive parameters are used to adapt the logic operation of the 4 logic inputs/2 logic outputs (⎓ 24 V) to the technology of the peripherals connected to the servo drive I/O (sensors, preactuators, PLC I/O, etc):

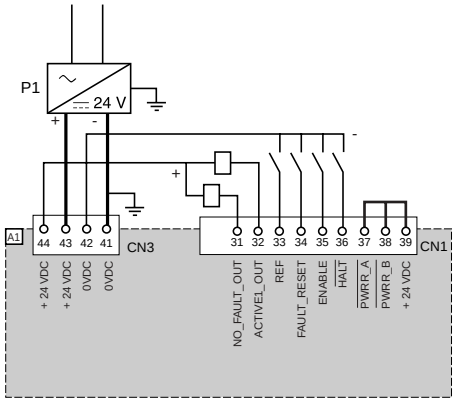
- Positive logic (default setting) for connection to PNP transistor sensors
- Negative logic for connection to NPN transistor peripherals

External ⎓ 24 V power supply

Positive logic (default setting) *(1)*



Negative logic *(2)*

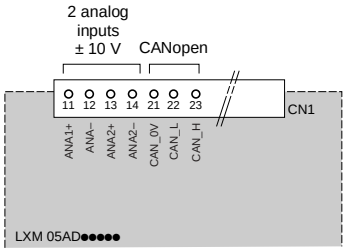


Logic I/O ⎓ 24 V	
Ref.	**Description**
31 "NO_FAULT_OUT" output	Servo drive fault
32 "ACTIVE1_OUT" output	Control of holding brake controller VW3 M3103
33 "REF" input	Not used *(3)*
34 "FAULT_RESET" input	Reset, fault acknowledgement *(3)*
35 "ENABLE" input	Enable servo drive power bridge *(3)*
36 "HALT" input	Stop servo drive (stopping category 1)

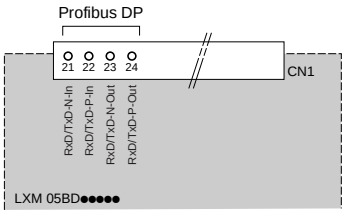
Compatible components	
Ref.	**Description**
A1	Lexium 05 servo drive, see page 16
P1	Phaseo (SELV) power supply ⎓ 24 V, please consult our "Interfaces, I/O splitter boxes and power supplies" catalogue

(1) Positive logic: Sink input, Source output
(2) Negative logic: Source input, Sink output
(3) If the servo drive is controlled via the communication network, these inputs have other assignments. Please consult the user's manual.

Specific spring terminals for LXM 05AD●●●●●



Specific spring terminals for LXM 05BD●●●●●



Servo drive control by Twido programmable controller

Via CANopen machine bus

Schemes and references, see page 18.

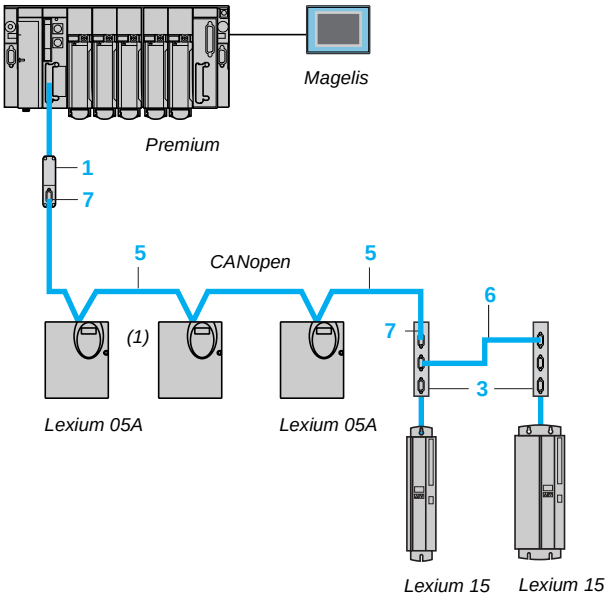
Via Modbus serial link

Schemes and references, see page 19.

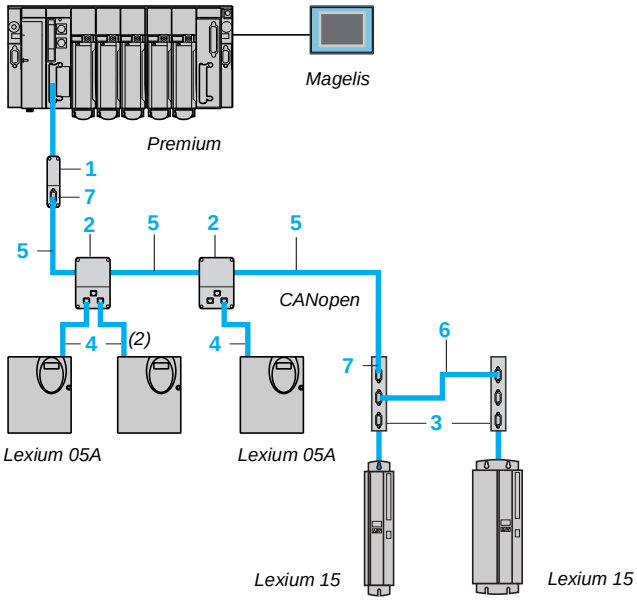
Servo drive control by Modicon Premium automation platform

Via CANopen machine bus

Example of daisy chain connection



Example of tap junction connection



1 PCMCIA card with tap junction and cable L = 0.5 m, TSX CPP 110
2 Junction box with 2 RJ 45 ports, VW3 CAN TAP2 *(3)*
3 CANopen bus adaptor for Lexium 15 servo drive (CANopen standard hardware interface), AM0 2CA 001V000
4 Cable fitted with 2 RJ45 connectors, VW3 CAN CARR03/1 (L = 0.3 or 1 m)
5 CANopen standard cables, TSX CAN CA/CB/CD 50/100/300 (L = 50, 100 or 300 m), with flying leads at both ends
6 Cable fitted with 2 SUB-D connectors (9-way, 1 male and 1 female), TLA CD CBA 005/015/030/050 (L = 0.5, 1.5, 3 or 5 m)
7 9-way female SUB-D IP 20 connector with line terminator, TSX CAN KCDF 90T/180T/90TP (right-angled, straight or right-angled with SUB-D for diagnostic tool)

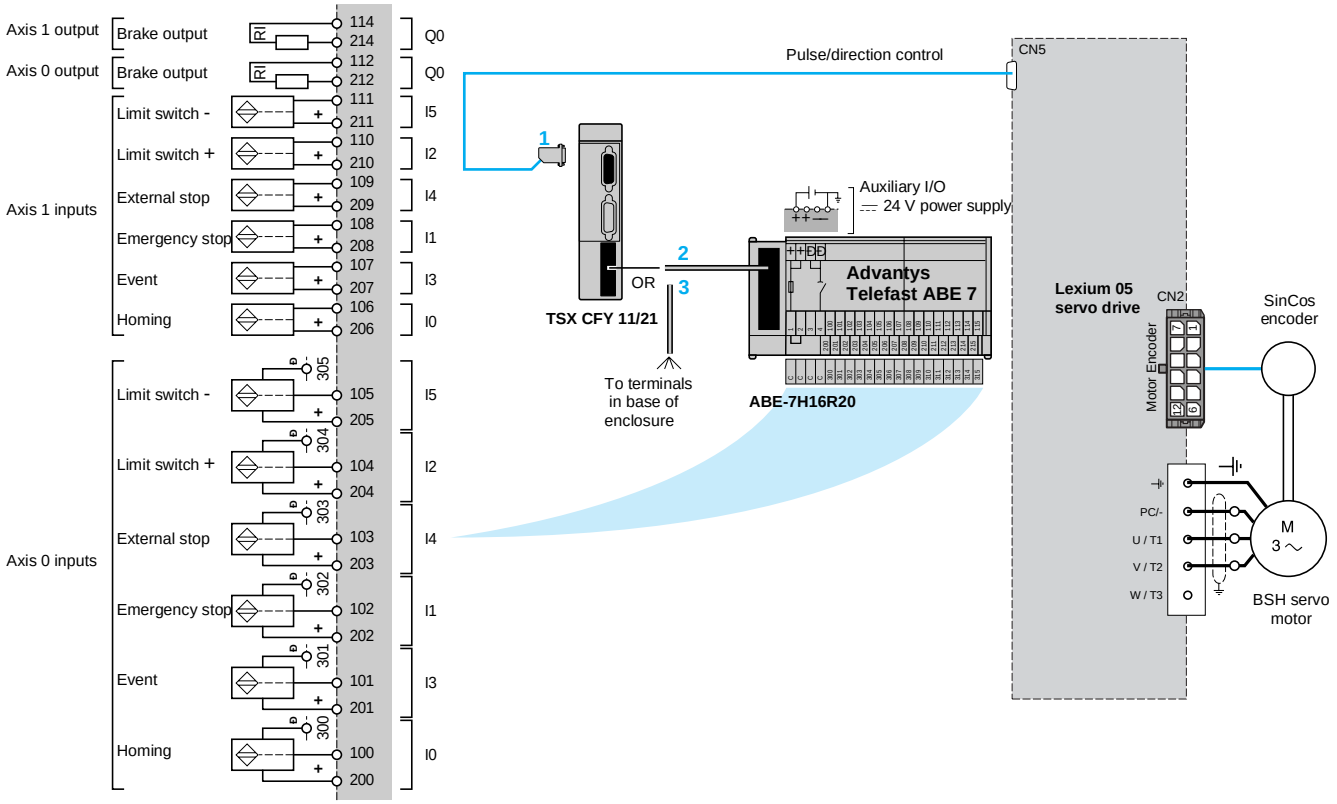
See references on page 18.

*(1) Connection to spring terminals (*CN1*)*
*(2) Connection to RJ45 connector (*CN4*)*
(3) Disconnect the line termination resistors from the junction box VW3 CAN TAP2 (included in the Lexium 05A servo drive).

Lexium 05 motion control
Lexium 05 servo drives

Servo drive control by Modicon Premium automation platform (continued)

Connection example for TSX CFY 11/21 motion control modules

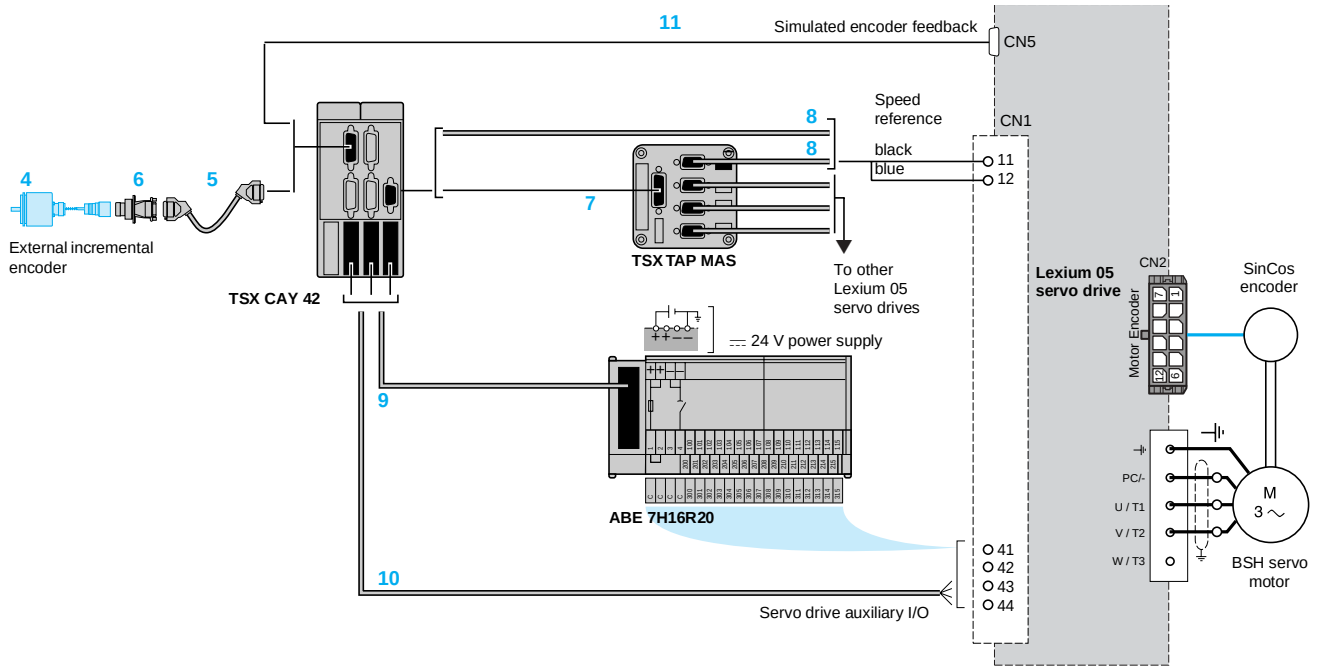


1 Cable with connectors VW3 M8 204 R●● (pulse/direction), see page 20

2 Cable with connectors TSX CDP053/103/203/303/503 (L = 0.5, 1, 2, 3 or 5 m)

3 Cable with connector at one end and flying leads at the other TSX CDP 301/501/1001 (L = 3, 5 or 10 m), see TSX CFY installation manual

Connection example for TSX CAY21/41/22/42/33 motion control modules



4 Absolute or incremental encoder
5 Cable with connectors TSX CCP S15 050/100 and TSX CCP S15 (L = 0.5, 1 or 2.5 m)
6 Connector TSX TAP S15 05

7 Cable with connectors TSX CXP 213/613 (L = 2.5 or 6 m)
8 Cable with connectors TSX CDP 611 (L = 6 m)
9 Cable with connectors TSX CDP053/103/203/303/503 (L = 0.5, 1, 2, 3 or 5 m)

10 Cable with connector at one end and flying leads at the other TSX CDP 301/501/1001 (L = 3, 5 or 10 m)
11 Cable with connectors VW3 M8 203 R●● (simulated incremental encoder feedback), see page 20

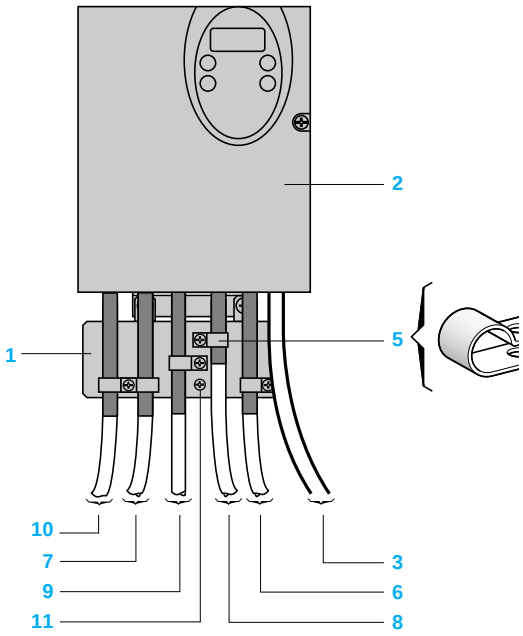
Lexium 05 motion control
Lexium 05 servo drives
Electromagnetic compatibility

Connections for ensuring conformity to EMC standards

Principle

■ The earths between the servo drive, servo motor and cable shielding must have “high frequency” equipotentiality.
■ Use shielded cables with shielding connected to earth throughout 360° at both ends for the servo motor cable, the braking resistor cable and the control-signalling cables. Conduit or metal ducting can be used for part of the shielding length provided that there is no break in the continuity of the earth connections.
■ Ensure maximum separation between the power supply cable (line supply) and the servo motor cable.

Installation diagram for LXM 05●D●●●● servo drives



1 Steel plate *supplied* with the servo drive, to be mounted on it (earthed casing)
2 Lexium 05 servo drive
3 Unshielded power supply wires or cable
4 Unshielded wires for the output of the fault relay contacts
5 Attach and earth the shielding of cables 6, 7, 8, 9 and 10 as close as possible to the servo drive:
- Strip the shielding.
- Attach the cable to the plate 1 by attaching the clamp to the stripped part of the shielding.
The shielding must be clamped tightly enough to the steel plate to ensure good contact.
6 Shielded cable for connecting the BSH servo motor power
7 Shielded cable for connecting the BSH servo motor encoder
8 Shielded cable for connecting the position interface signals (A/B encoder or pulse/direction)
9 Shielded cable for connecting the communication network (CANopen, Modbus or Profibus DP)
10 Shielded cable for connecting the braking resistor
For cables 6, 7, 8, 9, 10, the shielding must be connected to earth at both ends. The shielding must be continuous and intermediate terminals must be placed in EMC shielded metal boxes.
11 Earth screw for servo motor cable

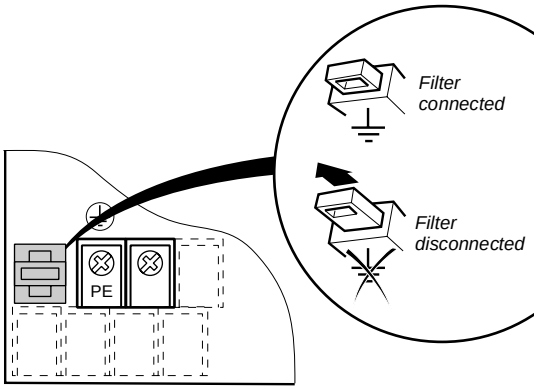
Note: *The HF equipotential earth connection between the servo drive, servo motor and cable shielding does not remove the need to connect the PE protective conductors (green-yellow) to the appropriate terminals on each unit.*
If using an additional EMC input filter, it should be mounted beneath the servo drive and connected directly to the line supply via an unshielded cable. Link 3 on the servo drive is via the filter output cable.

Operation on an IT system

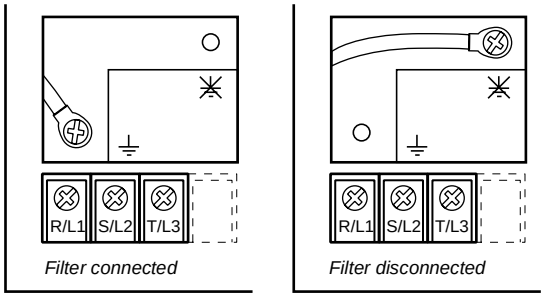
Principle

IT system: Isolated or impedance earthed neutral
Use a permanent insulation monitor compatible with non-linear loads, such as a Merlin Gerin type XM200 (please consult your Regional Sales Office).

LXM 05●D●●F1/M2/N4 servo drives have an integrated EMC filter. These filters must be isolated from earth for use on an IT system. For this disconnection see below, depending on the model.



LXM 05●D●●F1
LXM 05●D●●M2
LXM 05●D14/22/34N4



LXM 05●D57N4

Lexium 05 motion control
Motor starters
Protection by circuit breaker

GV2 L●●
+
LC1 K06●●●●
+
LXM 05●D●●●●●

Applications

The combinations listed below can be used to create a complete motor starter unit comprising a circuit breaker, a contactor and a Lexium 05 servo drive.
The circuit breaker provides protection against accidental short-circuits, disconnection and, if necessary, isolation.
The contactor starts up and manages any safety features, as well as isolating the servo motor on stopping.
The servo drive controls the servo motor, provides protection against short-circuits between the servo drive and the servo motor and protects the motor cable against overloads. The overload protection is provided by the motor thermal protection of the servo drive.

Motor starters for Lexium 05 servo drives

Servo drive	Nominal power	Circuit-breaker		Max. prsp. line Isc	Contactor *(1)* Add the voltage reference to the basic reference to obtain the full reference *(2)*
		Reference	Rating		
	kW		A	kA	
Single phase supply voltage: 100…120 V					
LXM 05●D10F1	0.4	**GV2 L14**	10	1	**LC1 K0610●●**
LXM 05●D17F1	0.65	**GV2 L16**	14	1	**LC1 K0610●●**
LXM 05●D28F1	1.4	**GV2 L20**	18	1	**LC1 K0610●●**
Single phase supply voltage: 200…240 V					
LXM 05●D10M2	0.75	**GV2 L14**	10	1	**LC1 K0610●●**
LXM 05●D17M2	1.2	**GV2 L16**	14	1	**LC1 K0610●●**
LXM 05●D28M2	2.5	**GV2 L22**	25	1	**LC1 D09●●**
Three-phase supply voltage: 200…240 V					
LXM 05●D10M3X	0.75	**GV2 L10**	6.3	5	**LC1 K0610●●**
LXM 05●D17M3X	1.4	**GV2 L16**	14	5	**LC1 K0610●●**
LXM 05●D42M3X	3.2	**GV2 L22**	25	5	**LC1 D09●●**
Three-phase supply voltage: 380…480 V					
LXM 05●D14N4	1.4	**GV2 L14**	10	5	**LC1 K0610●●**
LXM 05●D22N4	2	**GV2 L14**	10	5	**LC1 K0610●●**
LXM 05●D34N4	3	**GV2 L16**	14	5	**LC1 K0610●●**
LXM 05●D57N4	6	**GV2 L22**	25	5	**LC1 D09●●**

(1) Composition of contactors:
- *LC1 K06: 3 poles + 1 "N/O" auxiliary contact*
- *LC1 D09: 3 poles + 1 "N/C" auxiliary contact + 1 "N/O" auxiliary contact*

(2) Usual control circuit voltages, see table below:

AC control circuit

	Volts ∿	24	48	110	220	230	240
LC1-K	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
	Volts ∿	**24**	**48**	**110**	**220/230**	**230**	**230/240**
LC1-D	50 Hz	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz	**B6**	**E6**	**F6**	**M6**	–	**U6**
	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**

Note: *For other voltages between 24 V and 660 V, or for a DC control circuit, please consult your Regional Sales Office.*

Lexium 05 motion control

Motor starters

Protection using fuses

Protection using class J fuses (UL standard)

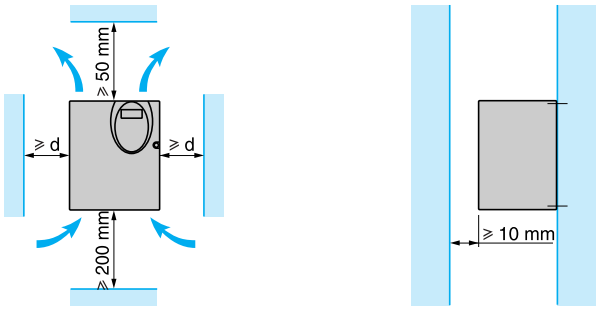
Servo drive	Nominal power	Fuse to be placed upstream
	kW	A
Single phase supply voltage: 100…120 V		
LXM 05●D10F1	0.4	10
LXM 05●D17F1	0.65	15
LXM 05●D28F1	1.4	25
Single phase supply voltage: 200…240 V		
LXM 05●D10M2	0.75	10
LXM 05●D17M2	1.2	15
LXM 05●D28M2	2.5	25
Three-phase supply voltage: 200…240 V		
LXM 05●D10M3X	0.75	10
LXM 05●D17M3X	1.4	10
LXM 05●D42M3X	3.2	25
Three-phase supply voltage: 380…480 V		
LXM 05●D14N4	1.4	10
LXM 05●D22N4	2	15
LXM 05●D34N4	3	15
LXM 05●D57N4	6	25

Mounting recommendations

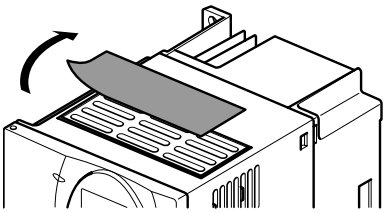
Lexium 05 servo drives, reference LXM 05●D10●●, are cooled by natural convection.

The other Lexium 05 servo drives, references LXM 05●D17●● to LXM 05●D57N4, have an integrated fan.

When installing the servo drive in the electrical enclosure, the instructions below should be followed with regard to the temperature and protection index:
- Provide sufficient cooling of the servo drive by complying with the minimum mounting distances.
- Do not mount the servo drive near heat sources.
- Do not mount the servo drive on flammable materials.
- Do not heat the servo drive cooling air by currents of hot air from other equipment and components, for example from an external braking resistor.
- If the servo drive is used above its thermal limits, the control stops due to overtemperature.
- When IP 20 protection is sufficient, we recommend that the protective film is removed once installation is complete.
- Mount the servo drive vertically (± 10%).



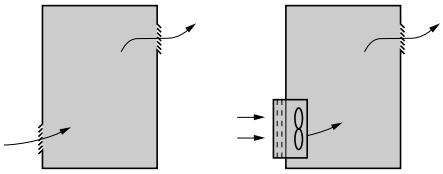
Note: *For cables that are connected via the underside of the servo drive, at least 200 mm free space is required under the unit to comply with the bending radius of the connection cables.*



Remove the protective cover if IP 20 is sufficient

Ambient temperature	Mounting distances	Instructions to be followed
- 10°C to + 40°C	d > 50 mm	–
	10 < d < 50 mm	Remove the protective cover
	0 < d < 10 mm	Remove the protective cover
+ 40°C to + 50°C	d > 50 mm	Remove the protective cover
	d < 50 mm	Remove the protective cover Reduce the output current by 2.2% per °C above 40°C

Note: *Do not use insulated enclosures as they have a poor level of conductivity.*



Natural convection *Forced cooling*

Recommendations for mounting in a wall-mounted or floor-standing enclosure

To ensure good air circulation in the servo drive:
- Fit ventilation grilles on the enclosure
- Ensure that ventilation is adequate: if not, install a forced ventilation unit with a filter
- Any apertures and/or fans must provide a flow rate at least equal to that of the servo drive fans (see below)
- Use special filters with IP 54 protection
- Remove the protective film stuck on the upper part of the servo drive

Dissipated power and fan flow rate compatible with Lexium 05 servo drive

Servo drive	Dissipated power	Ventilation	Flow rate
LXM 05●D10F1 LXM 05●D10M2 LXM 05●D10M3X	43 W 48 W 43 W	Natural convection	0.3 m^3/min
LXM 05●D17F1 LXM 05●D17M2 LXM 05●D17M3X LXM 05●D14N4	76 W 74 W 68 W 65 W	Integrated fan	0.55 m^3/min
LXM 05●D28F1 LXM 05●D22N4 LXM 05●D28M2 LXM 05●D42M3X LXM 05●D34N4	150 W 90 W 142 W 132 W 147 W	Integrated fan	1.55 m^3/min
LXM 05●D57N4	240 W	Integrated fan	1.75 m^3/min

Metal dust and damp proof wall-mounted or floor-standing enclosure (IP 54 degree of protection)

The servo drive must be mounted in a dust and damp proof enclosure in certain environmental conditions, such as dust, corrosive gases, high humidity with risk of condensation and dripping water, splashing liquid, etc.
In these cases, Lexium 05 servo drives can be installed in an enclosure where the internal temperature must not exceed 50°C.

Calculating the dimensions of the enclosure

Maximum thermal resistance Rth (°C/W)

The thermal resistance is defined by the following formula:

$$R_{th} = \frac{\theta° - \theta e}{P}$$

$\theta°$ = maximum temperature inside the enclosure in °C
θe = maximum external temperature in °C
P = total power dissipated in the enclosure in W

Power dissipated by the servo drive: see table above. Add the power dissipated by the other equipment components.

Useful heat exchange area of the enclosure S (m^2)

For a wall-mounted enclosure, the useful heat exchange area is defined as the sum of the areas of the two sides + top + front panel.

$$S = \frac{k}{R_{th}}$$

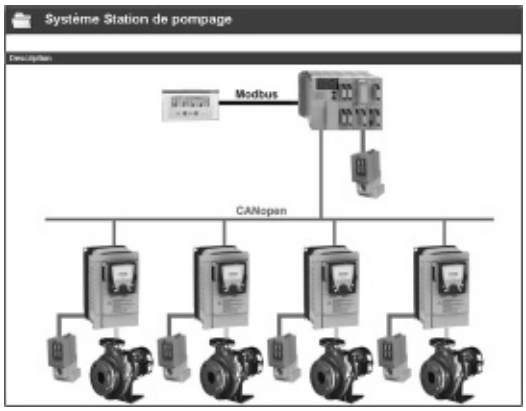
k = thermal resistance per m^2 of the enclosure

For metal enclosures:
- k = 0.12 with internal fan,
- k = 0.15 without fan

Note: *Do not use insulated enclosures as they have a poor level of conductivity.*

PowerSuite software workshop

534513



PowerSuite screen on PC
Installed base management

Presentation

The PowerSuite software workshop for PC is a user-friendly tool designed for setting up control devices for the following Telemecanique brand motors:
- TeSys U controller-starters
- Altistart soft start/soft stop units
- Altivar variable speed drives
- Lexium 05 servo drives

It includes various functions designed for setup phases such as:
- Preparing configurations
- Start-up
- Maintenance

In order to simplify the start-up and maintenance phases, the PowerSuite software workshop can use the Bluetooth® wireless link.

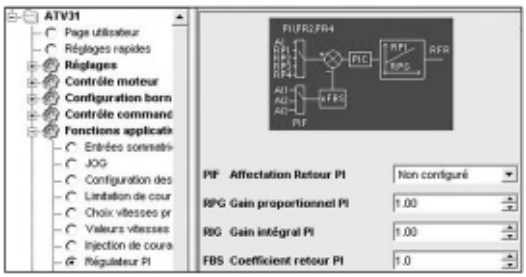
Functions *(1)*

Preparing configurations

The PowerSuite software workshop can be used on its own to generate the device configuration. It can be saved, printed and exported to office automation software.

The PowerSuite software workshop can also be used to convert:
- An Altivar 28 drive configuration to an Altivar 31 drive configuration
- An Altivar 38 drive configuration to an Altivar 61 drive configuration
- An Altivar 58 or Altivar 58F drive configuration to an Altivar 71 drive configuration.

533181



PowerSuite screen on PC
View of PI regulator function parameters

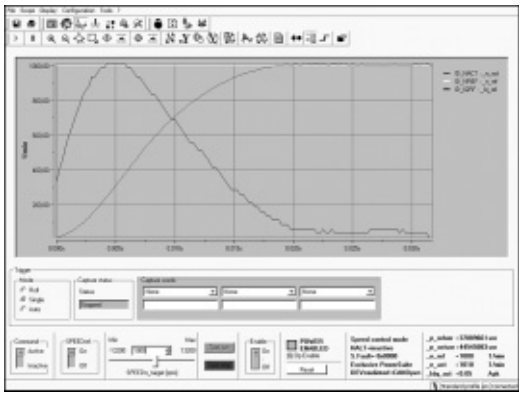
Start-up

When the PC is connected to the device, the PowerSuite software workshop can be used to:
- Transfer the generated configuration
- Adjust
- Monitor. This option has been enhanced with new functions such as:
  - The oscilloscope
  - The high-speed oscilloscope (minimum time base: 2 ms)
  - The FFT *(Fast Fourier Transform)* oscilloscope
  - Displaying communication parameters
- Control
- Save the final configuration

Maintenance

In order to simplify maintenance operations, the PowerSuite software workshop can be used to:
- Compare the configuration of a device currently being used with a saved configuration
- Manage the user's installed base of equipment, in particular:
  - Organize the installed base into folders (electrical equipment, machinery, workshops, etc.)
  - Store maintenance messages
  - Simplify Ethernet connection by storing the IP address

572706



View of the FTT oscilloscope function

User interface

The PowerSuite software workshop can be used to:
- Present the device parameters arranged by function in the form of illustrated views of diagrams or simple tables
- Customize the parameter names
- Create:
  - A user menu (choice of particular parameters)
  - Monitoring control panels with graphic elements (cursors, gauges, bar charts
- Perform sort operations on the parameters
- Display text in five languages (English, French, German, Italian and Spanish). The language changes immediately and there is no need to restart the program.

It also has online contextual help:
- On the PowerSuite tool
- On the device functions by direct access to the user manuals

(1) Some functions are not available for all devices.
See the table of function availability, page 51.

References:
page 52

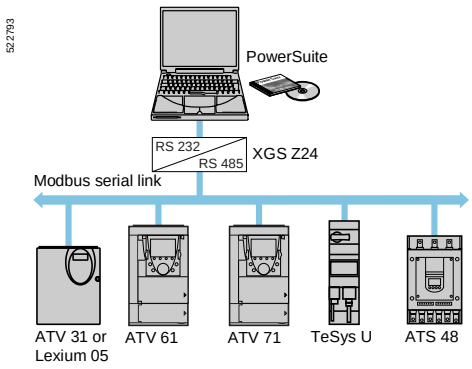
PowerSuite software workshop

Function availability for the PowerSuite software workshop

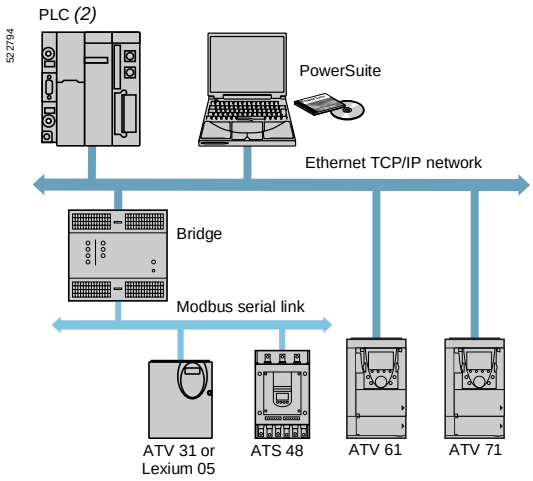
Functions not listed in the table are available for all devices.

Function available with devices	Controller-starter	Soft start/ soft stop unit	Drives				Servo drives
	TeSys U	ATS 48	ATV 11	ATV 31	ATV 61	ATV 71	LXM 05
Monitoring	■	■	□	■	■	■	■
Oscilloscope	□	□	□	■	■	■	■
High-speed oscilloscope	□	□	□	□	■	■	■
FFT oscilloscope	□	□	□	□	■	■	■
Display of communication parameters	□	□	□	□	■	■	■
Control	■	■	□	■	■	■	■
Customization of parameter names	□	□	■	■	■	■	■
Creation of a user menu	□	□	■	■	■	■	■
Creation of monitoring control panels	□	□	□	■	■	■	■
Sort operation on parameters	□	□	■	■	■	■	■

■ Functions available
□ Functions not available



Modbus multidrop connection



Ethernet connection

Connections (1)

Modbus serial link

The PowerSuite software workshop can be connected directly to the device terminal port or Modbus serial link port via the serial port on the PC.

Two types of connection are possible:
- With a single device (point-to-point connection), using a VW3 A8 106 PC serial port connection kit
- With a number of devices (multidrop connection), using the XGS Z24 interface.

Ethernet TCP/IP communication network

The PowerSuite software workshop can be connected to an Ethernet TCP/IP network.
In this case, the devices can be accessed:
- Using a VW3 A3 310 communication card for the Altivar 61 and 71 drives
- Using a TSX ETG 100 Ethernet/Modbus bridge

Bluetooth® wireless link

The PowerSuite software workshop can communicate via a Bluetooth® radio link with a device equipped with a Bluetooth® - Modbus VW3 A8 114 adapter. The adapter plugs into the device connector terminal port or Modbus serial link port and has a range of 10 m (class 2).

If the PC does not have Bluetooth® technology, use the VW3 A8 115 USB-Bluetooth® adapter.

Remote maintenance

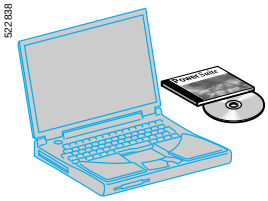
Using a simple Ethernet connection, the PowerSuite software workshop can be used for remote monitoring and diagnostics.
When devices are not connected to the Ethernet network, or it is not directly accessible, various remote transmission solutions may be possible (modem, teleprocessing gateway, etc.). Please consult your Regional Sales Office.

(1) Please refer to the compatibility table on page 53.
(2) Please refer to our "Automation platform Modicon Premium and Unity - PL7 software" and "Automation platform Modicon TSX Micro - PL7 software" catalogues.

Presentation: page 50
References: page 52

PowerSuite software workshop

PowerSuite software workshop



VW3 A8 104

VW3 A8 114

Description	Composition	Reference	Weight kg
PowerSuite CD-ROM	■ 1 program for PC in English, French, German, Italian and Spanish ■ Variable speed drive, starter and servo drive technical manuals ■ ABC Configurator software for the LUF P communication gateways	**VW3 A8 104**	0.100
PowerSuite update CD-ROM *(1)*	■ 1 program for PC in English, French, German, Italian and Spanish ■ Variable speed drive and starter technical manuals	**VW3 A8 105**	0.100
Connection kit for PC serial port for point-to-point Modbus connection	■ 1 x 3 m cable with 2 RJ45 connectors ■ 1 RS 232/RS 485 converter with one 9-way female SUB-D connector and 1 RJ45 connector ■ 1 converter for the ATV 11 drive, with one 4-way male connector and one RJ45 connector ■ 1 RJ45/9-way male SUB-D adapter for connecting ATV 38/58/58F drives ■ 1 RJ45/9-way female SUB-D adapter for connecting ATV 68 drives.	**VW3 A8 106**	0.350
RS 232-RS 485 interface for multidrop Modbus connection	1 multidrop Modbus converter for connection to screw terminals. Requires a 24 V ⎓ (20...30 V), 20 mA power supply *(2)*.	**XGS Z24**	0.105
Modbus-Bluetooth® adapter *(3)*	■ 1 Bluetooth® adapter (10 m range, class 2) with 1 RJ45 connector ■ 1 x 0.1 m cable with 2 RJ45 connectors for PowerSuite ■ 1 x 0.1 m cable with 1 RJ45 connector and 1 mini DIN connector for TwidoSoft ■ 1 RJ45/9-way male SUB-D adapter for connecting ATV 38/58/58F drives.	**VW3 A8 114**	0.155
USB-Bluetooth® adapter for PC	This adapter is required for a PC which is not equipped with Bluetooth® technology. It is connected to a USB port on the PC. Range of 10 m (class 2).	**VW3 A8 115**	0.290

(1) Updates a version ≥ V1.40 with the latest available version. For versions < V1.40, you should order the PowerSuite CD-ROM, VW3 A8 104.
(2) Please consult our specialist catalogue "Power supplies, splitter blocks and interfaces".
(3) Can also be used to communicate between a Twido PLC and the TwidoSoft software workshop.

Presentation:
page 50

Functions:
pages 50 and 51

PowerSuite software workshop

Compatibility of PowerSuite software workshop with the following devices *(1)*

Connection	Controller-starter	Soft start/ soft stop unit	Drives				Servo drives
	TeSys U	ATS 48	ATV 11	ATV 31	ATV 61	ATV 71	LXM 05A *(2)*
Modbus	V1.40	V1.30	V1.40	V2.0	V2.3	V2.2	V2.2
Ethernet (device equipped with an Ethernet TCP/IP card)					V2.3	V2.2	
Ethernet via Ethernet/Modbus bridge		V1.50		V2.0	V2.3	V2.2	V2.2
Bluetooth®		V2.2		V2.2	V2.3	V2.2	V2.2

Compatible software versions
Incompatible software versions

Hardware and software environments

The PowerSuite software workshop can operate in the following PC environments and configurations:

- Microsoft Windows® 98 SE, Microsoft Windows® 2000 SP4, Microsoft Windows® XP SP1, SP2,
- Pentium III, 800 MHz, hard disk with 300 MB available, 128 MB RAM
- SVGA or higher definition monitor

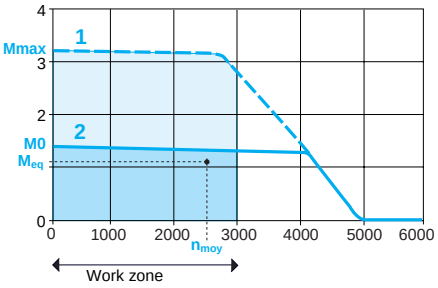
(1) Minimum software version
(2) For the LXM 05B●●●●●● servo drives, please consult your Regional Sales Office.

Presentation: page 50
Functions: pages 50 and 51
References: page 52

Lexium 05 motion control
BSH servo motors

BSH servo motor with straight connectors

BSH servo motor with angled connectors



Presentation

BSH servo motors are the ideal choice to meet the requirements of dynamics and precision. With five flange sizes and a variety of lengths, there is a suitable solution for most applications, covering a torque range from 0.42 to 33.5 Nm for speeds ranging from 1250 to 6000 rpm.

Their new winding technology based on salient poles makes BSH servo motors very compact in comparison with conventional servo motors.
BSH servo motors are available in 5 flange sizes: 55, 70, 100, 140 and 205 mm.
Thermal protection is provided by a temperature probe integrated in the servo motors. They are certified “Recognized” by the Underwriters Laboratories and comply with standard UL1004 (except for the BSH 1404P servo motor) and with European directives (CE marking).
BSH servo motors are available with the following variants:
- IP40 or IP65 degree of protection
- With or without holding brake
- Straight or angled connectors
- Single turn or multiturn SinCos encoder
- Smooth or keyed shaft end

Torque/speed characteristics

BSH servo motors provide torque/speed curve profiles similar to the example shown on the left with:
1 Peak torque, depending on the servo drive model
2 Continuous torque, depending on the servo drive model
where:
- 6000 (in rpm) corresponds to the servo motor's maximum mechanical speed
- M_{max} (in Nm) represents the peak stall torque value
- M_n (in Nm) represents the continuous stall torque value

Principle for determining servo motor size according to the application

The torque/speed curves can be used to determine the correct servo motor size. For example, for a 115 V single phase supply voltage, the curves used are curves 1 and 2.
1 Locate the work zone of the application in terms of speed.
2 Verify, using the servo motor cycle timing diagram, that the torques required by the application during the various phases of the cycle are located within the area bounded by curve 1 in the work zone.
3 Calculate the average speed n_{avg} and the equivalent thermal torque M_{eq} (see page 92).
4 The point defined by n_{avg} and M_{eq} must be located below curve 2 in the work zone.

Note: *For sizing of servo motors: see page 92.*

Functions

General functions

BSH servo motors have been developed to meet the following requirements:
- Functional characteristics, ruggedness, safety, etc in accordance with IEC/EN 60034-1
- Ambient operating temperature: - 20...40°C according to DIN 50019R14. Maximum 55°C with derating from 40°C of 1% per °C
- Relative humidity: Class F according to DIN 400
- Altitude: 1000 m without derating, 2000 m with k = 0.86 *(1)*, 3000 m with k = 0.8
- Storage and transport temperature: - 25...70°C
- Winding insulation class: F (maximum temperature for windings 155°C) according to DIN VDE 0530
- Power and sensor connections via straight or angled connectors
- Thermal protection by built-in PTC thermistor probe, controlled by the Lexium 05 servo drive
- Out-of-round, concentricity and perpendicularity between flange and shaft according to DIN 42955, class N
- Flange compliant with standard DIN 42948
- Permitted mounting positions: no mounting restrictions for IMB5 - IMV1 and IMV3 according to DIN 42950
- Polyester resin based paint: opaque black RAL 9005

(1) k: derating factor

Characteristics: pages 56 to 79
References: pages 80 to 82
Dimensions: pages 83 to 85

Functions (continued)

General functions (continued)

- Degree of protection:
  - Servo motor casing: IP 65 in accordance with IEC/EN 60529
  - Shaft end: IP 40 or IP 65 in accordance with IEC/EN 60529 *(1)*
- Integrated sensor: SinCos Hiperface single turn or multiturn high resolution encoder
- Smooth or keyed shaft end in standard sizes (according to DIN 42948)

Holding brake (depending on model)

The integrated brake fitted on BSH servo motors (depending on the model) is a failsafe electro-magnetic holding brake.

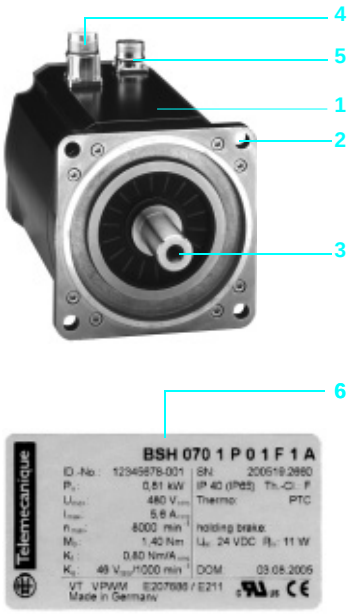
⚠ **Do not use the holding brake as a dynamic brake for deceleration, as this will quickly damage the brake.**

Built-in encoder

The servo motor is fitted with a SinCos Hiperface® high resolution single turn (4096 points) or multiturn (4096 points x 4096 turns) absolute encoder providing angular precision of the shaft position, accurate to less than ± 1.3 arc minutes.

This performs the following functions:

- Gives the angular position of the rotor so that flows can be synchronized
- Measures the servo motor speed via the associated Lexium 05 servo drive. This information is used by the speed controller of the Lexium servo drive.
- Measures the position information for the Lexium servo drive position controller
- Measures and sends position information in incremental format for the position feedback of a motion control module (“simulated encoder” output of the Lexium 05 servo drive)



Description

BSH servo motors with a 3-phase stator and a 6- to 10-pole rotor (depending on model) with Neodymium Iron Borium (NdFeB) magnets consist of:

1. A casing with a square cross-section, protected by RAL 9005 opaque black paint
2. A 4-point axial fixing flange in accordance with DIN 42948
3. A standard shaft end in accordance with DIN 42948, smooth or keyed (depending on the model)
4. A threaded dust and damp proof male straight connector for connecting the power cable *(2)*
5. A threaded dust and damp proof male straight connector for connecting the encoder cable *(2)*
6. A manufacturer's rating plate on the right side

Connectors to be ordered separately, for connection to Lexium 05 servo drives, see page 82.
Schneider Electric has taken particular care to ensure compatibility between BSH servo motors and Lexium 05 servo drives. This compatibility can only be assured by using cables and connectors sold by Schneider Electric, see page 82.

(1) IP 40 mounted in position IMV3 (vertical mounting with shaft end at the top)
(2) Other model with angled connector that can be rotated through 330°

Lexium 05 motion control
BSH servo motors

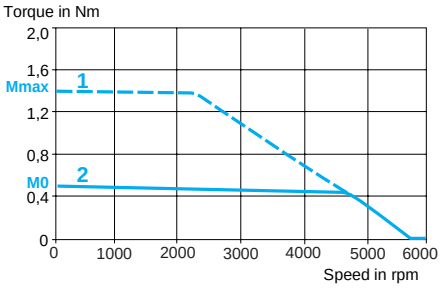
Characteristics with BSH 0551T servo motors

Type of servo motor				BSH 0551T		
Associated with Lexium 05 servo drive				**LXM 05●D10F1**	**LXM 05●D10M2**	**LXM 05●D10M3X**
Line supply voltage			**V**	115 single phase	230 single phase	230 3-phase
Switching frequency			**kHz**	8		
Torque	Continuous stall	M_0	**Nm**	0.5		
	Peak stall	M_{max}	**Nm**	1.4		
Nominal operating point	Nominal torque		**Nm**	0.46	0.43	0.42
	Nominal speed		**rpm**	3000	6000	
Maximum current			**A rms**	6.2		
Servo motor characteristics						
Maximum mechanical speed			**rpm**	9000		
Constants (at 120°C)	Torque		**Nm/A rms**	0.36		
	Back emf		**V_{rms}/krpm**	22		
Rotor	Number of poles			6		
	Inertia	Without brake J_m	**kgcm²**	0.059		
		With brake J_m	**kgcm²**	0.1113		
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	12.2		
	Inductance (phase/phase)		**mH**	20.8		
	Electrical time constant		**ms**	1.705		
Holding brake (depending on model)				See page 86		

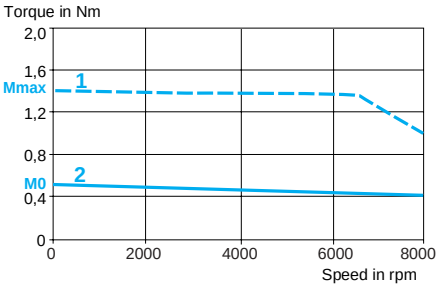
Speed/torque curves

BSH 0551T servo motors

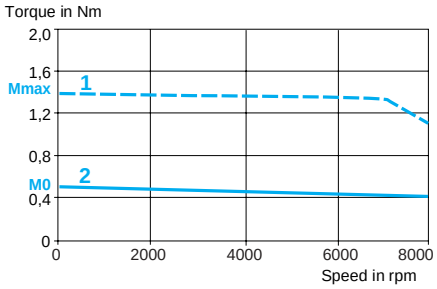
With LXM 05●D10F1 servo drive
115 V single phase



With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

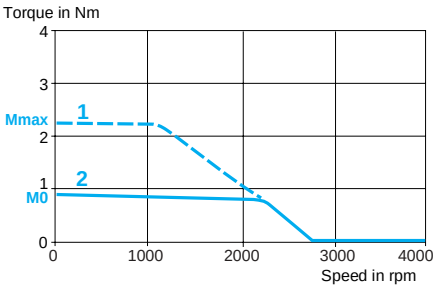
Characteristics of BSH 0552M/0552P servo motors

Type of servo motor				BSH 0552M		BSH 0552P		
Associated with Lexium 05 servo drive				LXM 05 ●D10M2	LXM 05 ●D10M3X	LXM 05 ●D10M2	LXM 05 ●D10M3X	LXM 05 ●D14N4
Line supply voltage			V	230 single phase	230 3-phase	230 single phase	230 3-phase	400/480 3-phase
Switching frequency			kHz	4		8		
Torque	Continuous stall	M_0	Nm	0.9				
	Peak stall	M_{max}	Nm	2.3		2.7		
Nominal operating point	Nominal torque		Nm	0.85		0.8		0.70
	Nominal speed		rpm	1500		4000		6000
Maximum current			A rms	2.9		5.9		
Servo motor characteristics								
Maximum mechanical speed			rpm	9000				
Constants (at 120°C)	Torque		Nm/A rms	1.33		0.7		
	Back emf		V_{rms}/krpm	74		40		
Rotor	Number of poles			6				
	Inertia	Without brake J_m	$kgcm^2$	0.096				
		With brake J_m	$kgcm^2$	0.1613				
Stator (at 20°C)	Resistance (phase/phase)		Ω	60.2		17.4		
	Inductance (phase/phase)		mH	122		35.3		
	Electrical time constant		ms	1.24				
Holding brake (depending on model)				See page 86				

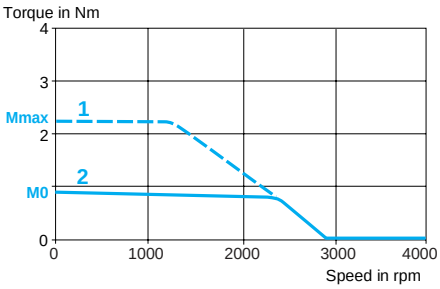
Speed/torque curves

BSH 0552M servo motor

With LXM 05●D10M2 servo drive
230 V single phase

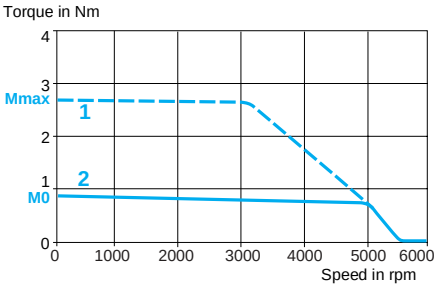


With LXM 05●D10M3X servo drive
230 V 3-phase

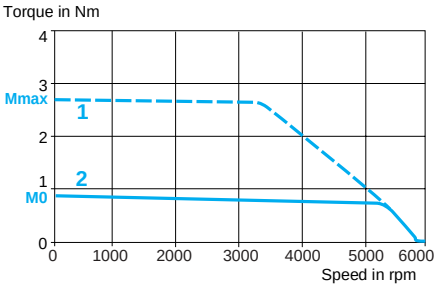


BSH 0552P servo motor

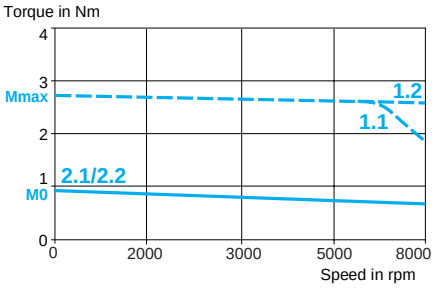
With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



With LXM 05●D14N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase

1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Presentation: page 54
References: pages 80 to 82
Dimensions: pages 83 to 85

Lexium 05 motion control
BSH servo motors

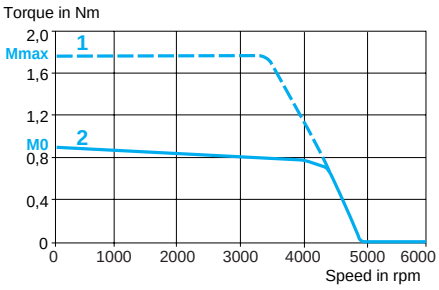
Characteristics of BSH 0552T servo motors

Type of servo motor				BSH 0552T			
Associated with Lexium 05 servo drive				LXM 05 ●D10F1	LXM 05 ●D17F1	LXM 05 ●D10M2	LXM 05 ●D10M3X
Line supply voltage			V	115 single phase	115 single phase	230 single phase	230 3-phase
Switching frequency			kHz	8			
Torque	Continuous stall	M_0	Nm	0.9			
	Peak stall	M_{max}	Nm	1.77	2.7	1.77	
Nominal operating point	Nominal torque		Nm	0.8		0.72	
	Nominal speed		rpm	3000		6000	
Maximum current			A rms	10.3			
Servo motor characteristics							
Maximum mechanical speed			rpm	9000			
Constants (at 120°C)	Torque		Nm/A rms	0.36			
	Back emf		V_{rms}/krpm	22			
Rotor	Number of poles			6			
	Inertia	Without brake J_m	kgcm²	0.14			
		With brake J_m	kgcm²	0.1613			
Stator (at 20°C)	Resistance (phase/phase)		Ω	5.2			
	Inductance (phase/phase)		mH	10.6			
	Electrical time constant		ms	1.24			
Holding brake (depending on model)				See page 86			

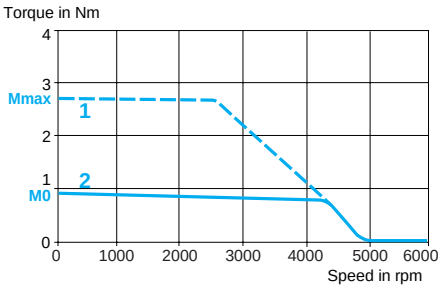
Speed/torque curves

BSH 0552T servo motor

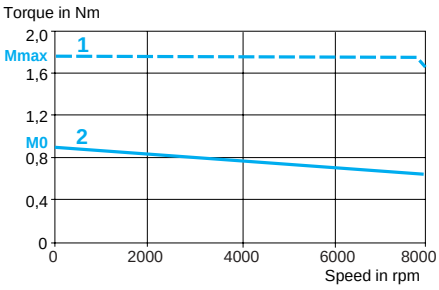
With LXM 05●D10F1 servo drive
115 V single phase



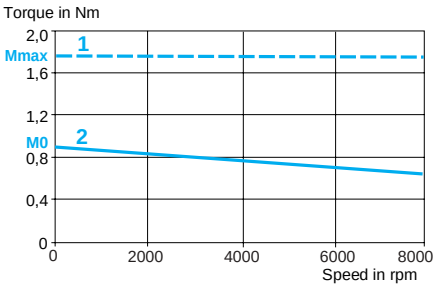
With LXM 05●D17F1 servo drive
115 V single phase



With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation: page 54
References: pages 80 to 82
Dimensions: pages 83 to 85

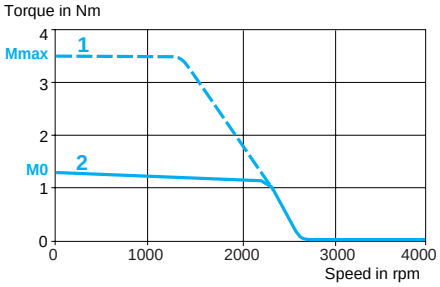
Characteristics of BSH 0553M servo motors

Type of servo motor				**BSH 0553M**	
Associated with Lexium 05 servo drive				**LXM 05 ●D10M2**	**LXM 05 ●D10M3X**
Line supply voltage			**V**	230 single phase	230 3-phase
Switching frequency			**kHz**	4	
Torque	Continuous stall	M_0	**Nm**	1.3	
	Peak stall	M_{max}	**Nm**	4.2	
Nominal operating point	Nominal torque		**Nm**	1.2	
	Nominal speed		**rpm**	1500	
Maximum current			**A rms**	4.3	
Servo motor characteristics					
Maximum mechanical speed			**rpm**	9000	
Constants (at 120°C)	Torque		**Nm/A rms**	1.33	
	Back emf		**V_{rms}/krpm**	79	
Rotor	Number of poles			6	
	Inertia	Without brake J_m	**kgcm²**	0.134	
		With brake J_m	**kgcm²**	0.2113	
Stator (at 20°C)	Resistance (phase/phase)		Ω	38.4	
	Inductance (phase/phase)		**mH**	92.2	
	Electrical time constant		**ms**	1.5	
Holding brake (depending on model)				See page 86	

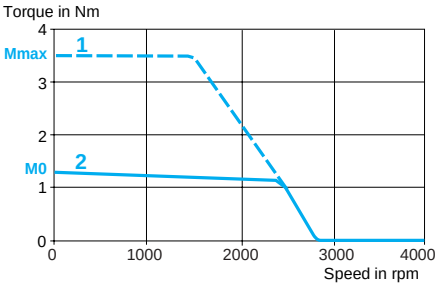
Speed/torque curves

BSH 0553M servo motors

With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Lexium 05 motion control
BSH servo motors

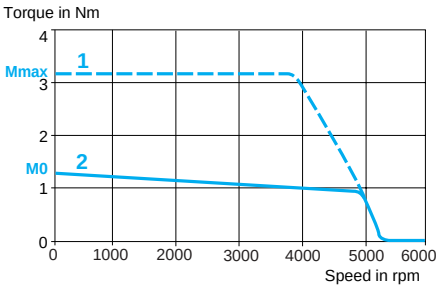
Characteristics of BSH 0553P/0553T servo motors

Type of servo motor				BSH 0553P			BSH 0553T		
Associated with Lexium 05 servo drive				LXM 05 ●D10M2	LXM 05 ●D10M3X	LXM 05 ●D14N4	LXM 05 ●D17F1	LXM 05 ●D17M2	LXM 05 ●D17M3X
Line supply voltage			V	230 single phase	230 3-phase	400/480 3-phase	115 single phase	230 single phase	230 3-phase
Switching frequency			kHz	8					
Torque	Continuous stall	M_0	Nm	1.3					
	Peak stall	M_{max}	Nm	3.18		3.87	3.31		
Nominal operating point	Nominal torque		Nm	1		0.9	11	0.9	
	Nominal speed		rpm	4000		6000	3000	6000	
Maximum current			A rms	8.7			15.2		
Servo motor characteristics									
Maximum mechanical speed			rpm	9000					
Constants (at 120°C)	Torque		Nm/A rms	0.7			0.39		
	Back emf		V_{rms}/krpm	41			22		
Rotor	Number of poles			6					
	Inertia	Without brake J_m	$kgcm^2$	0.134					
		With brake J_m	$kgcm^2$	0.2113					
Stator (at 20°C)	Resistance (phase/phase)		Ω	10.4			3.1		
	Inductance (phase/phase)		mH	25			7.4		
	Electrical time constant		ms	1.5					
Holding brake (depending on model)				See page 86					

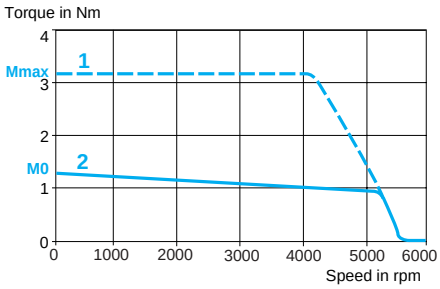
Speed/torque curves

BSH 0553P servo motors

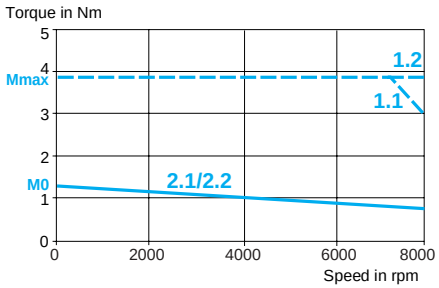
With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase

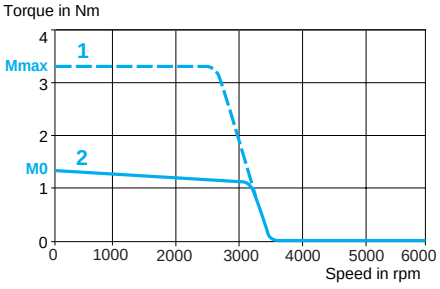


With LXM 05●D14N4 servo drive
400/480 V 3-phase

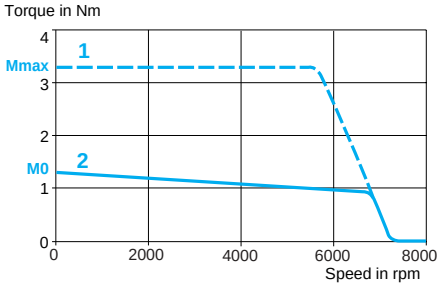


BSH 0553T servo motor

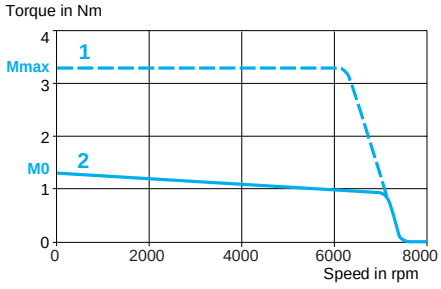
With LXM 05●D17F1 servo drive
115 V single phase



With LXM 05●D17M2 servo drive
230 V single phase



With LXM 05●D17M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase

1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Presentation: page 54
References: pages 80 to 82
Dimensions: pages 83 to 85

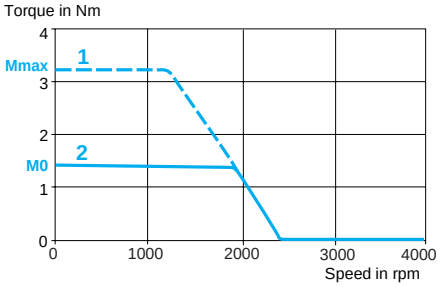
Characteristics of BSH 0701M/0701P servo motors

Type of servo motor				BSH 0701M	BSH 0701P	
Associated with Lexium 05 servo drive				LXM 05 ●D10M3X	LXM 05 ●D10M2	LXM 05 ●D10M3X
Line supply voltage			**V**	230 3-phase	230 single phase	230 3-phase
Switching frequency			**kHz**	4		
Torque	Continuous stall	M_0	**Nm**	1.4		
	Peak stall	M_{max}	**Nm**	3.2		
Nominal operating point	Nominal torque		**Nm**	1.36	1.3	
	Nominal speed		**rpm**	1500	3000	
Maximum current			**A rms**	2.8	5.3	
Servo motor characteristics						
Maximum mechanical speed			**rpm**	8000		
Constants (at 120°C)	Torque		**Nm/A rms**	1.6	0.8	
	Back emf		**V_{rms}/krpm**	91	46	
Rotor	Number of poles			6		
	Inertia	Without brake J_m	**kgcm²**	0.25		
		With brake J_m	**kgcm²**	0.322		
Stator (at 20°C)	Resistance (phase/phase)		Ω	41.6	10.4	
	Inductance (phase/phase)		**mH**	173.2	38.8	
	Electrical time constant		**ms**	4.16	3.73	
Holding brake (depending on model)				See page 86		

Speed/torque curves

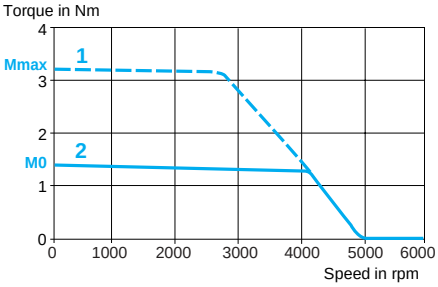
BSH 0701M servo motor

With LXM 05●D10M3X servo drive
230 V 3-phase

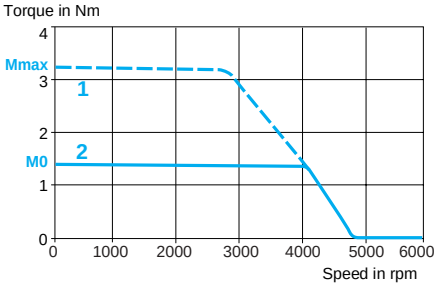


BSH 0701P servo motor

With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

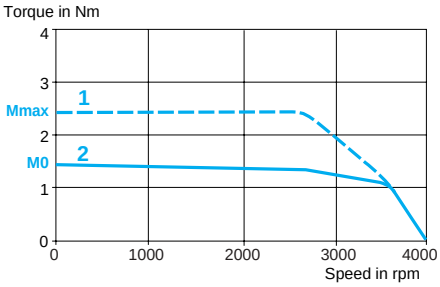
Characteristics of BSH 0701T servo motors

Type of servo motor				BSH 0701T			
Associated with Lexium 05 servo drive				LXM 05 ●D10F1	LXM 05 ●D17M2	LXM 05 ●D10M3X	LXM 05 ●D17M3X
Line supply voltage			**V**	115 single phase	230 single phase	230 3-phase	230 3-phase
Switching frequency			**kHz**	8			
Torque	Continuous stall	M_0	**Nm**	1.4			
	Peak stall	M_{max}	**Nm**	2.42	3.19	2.41	3.19
Nominal operating point	Nominal torque		**Nm**	1.43	1.32	1.2	1.32
	Nominal speed		**rpm**	2500	5000	6000	5000
Maximum current			**A rms**	9.9			
Servo motor characteristics							
Maximum mechanical speed			**rpm**	8000			
Constants (at 120°C)	Torque		**Nm/A rms**	0.46			
	Back emf		**V_{rms}/krpm**	27			
Rotor	Number of poles			6			
	Inertia	Without brake J_m	**kgcm²**	0.25			
		With brake J_m	**kgcm²**	0.322			
Stator (at 20°C)	Resistance (phase/phase)		Ω	3.3			
	Inductance (phase/phase)		**mH**	12.6			
	Electrical time constant		**ms**	3.81			
Holding brake (depending on model)				See page 86			

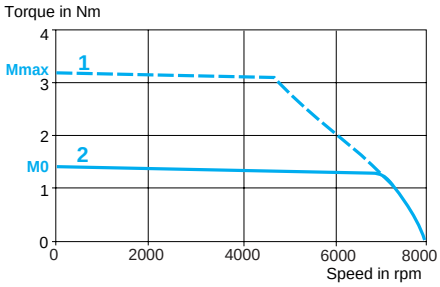
Speed/torque curves

BSH 0701T servo motor

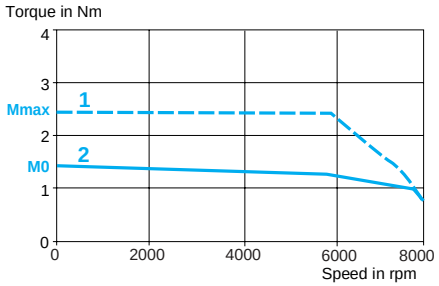
With LXM 05●D10F1 servo drive
115 V single phase



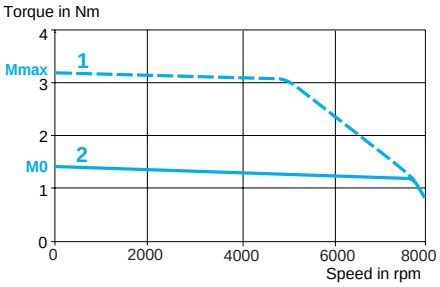
With LXM 05●D17M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



With LXM 05●D17M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Characteristics of BSH 0702M servo motors

Type of servo motor				**BSH 0702M**	
Associated with Lexium 05 servo drive				**LXM 05●D10M2**	**LXM 05●D10M3X**
Line supply voltage			**V**	230 single phase	230 3-phase
Switching frequency			**kHz**	4	
Torque	Continuous stall	M_0	**Nm**	2.1	
	Peak stall	M_{max}	**Nm**	6.8	
Nominal operating point	Nominal torque		**Nm**	2.12	
	Nominal speed		**rpm**	1500	
Maximum current			**A rms**	5.9	

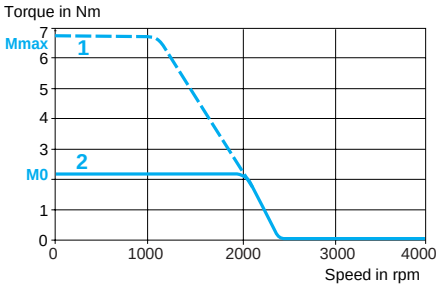
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000	
Constants (at 120°C)	Torque		**Nm/A rms**	1.46	
	Back emf		**V_{rms}/krpm**	93	
Rotor	Number of poles			6	
	Inertia	Without brake J_m	**kgcm²**	0.41	
		With brake J_m	**kgcm²**	0.482	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	17.3	
	Inductance (phase/phase)		**mH**	84.4	
	Electrical time constant		**ms**	4.88	
Holding brake (depending on model)				See page 86	

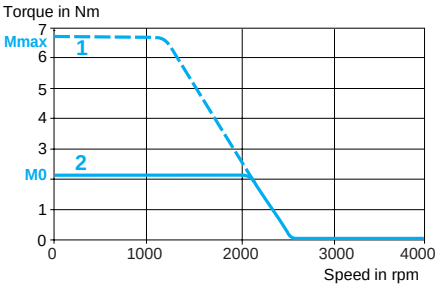
Speed/torque curves

BSH 0702M servo motor

With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Lexium 05 motion control
BSH servo motors

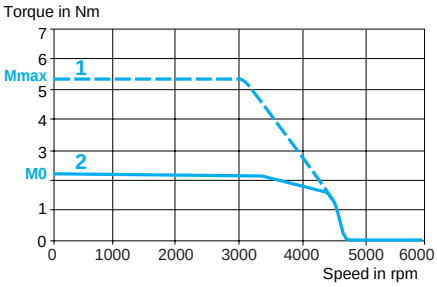
Characteristics of BSH 0702P servo motors

Type of servo motor				BSH 0702P				
Associated with Lexium 05 servo drive				LXM 05 ●D10M2	LXM 05 ●D17M2	LXM 05 ●D10M3X	LXM 05 ●D17M3X	LXM 05 ●D14N4
Line supply voltage			V	230 single phase	230 single phase	230 3-phase	230 3-phase	400/480 3-phase
Switching frequency			kHz	4				
Torque	Continuous stall	M_0	Nm	2.2				
	Peak stall	M_{max}	Nm	5.37	7.55	5.37	7.55	
Nominal operating point	Nominal torque		Nm	1.9				1.6
	Nominal speed		rpm	3000				6000
Maximum current			A rms	9.8				
Servo motor characteristics								
Maximum mechanical speed			rpm	8000				
Constants (at 120°C)	Torque		Nm/A rms	0.77				
	Back emf		V_{rms}/krpm	48				
Rotor	Number of poles			6				
	Inertia	Without brake J_m	$kgcm^2$	0.41				
		With brake J_m	$kgcm^2$	0.482				
Stator (at 20°C)	Resistance (phase/phase)		Ω	4.2				
	Inductance (phase/phase)		mH	21.3				
	Electrical time constant		ms	5.07				
Holding brake (depending on model)				See page 86				

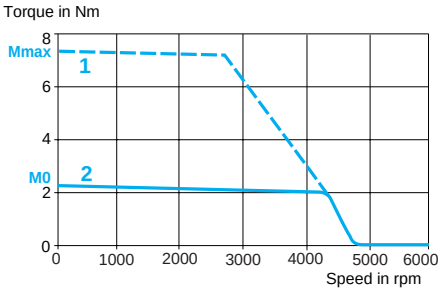
Speed/torque curves

BSH 0702P servo motor

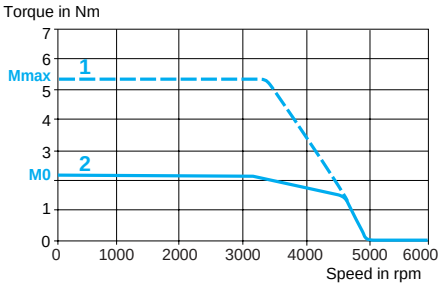
With LXM 05●D10M2 servo drive
230 V single phase



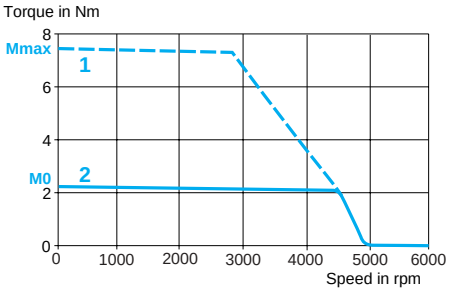
With LXM 05●D17M2 servo drive
230 V single phase



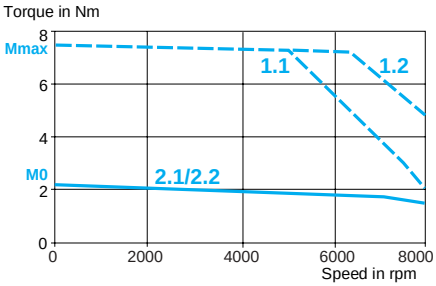
With LXM 05●D10M3X servo drive
230 V 3-phase



With LXM 05●D17M3X servo drive
230 V 3-phase



With LXM 05●D14N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase

1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Presentation: page 54
References: pages 80 to 82
Dimensions: pages 83 to 85

Characteristics of BSH 0702T servo motors

Type of servo motor				BSH 0702T			
Associated with Lexium 05 servo drive				**LXM 05 ●D17F1**	**LXM 05 ●D17M2**	**LXM 05 ●D28M2**	**LXM 05 ●D42M3X**
Line supply voltage			**V**	115 single phase	230 single phase	230 single phase	230 3-phase
Switching frequency			**kHz**	8			
Torque	Continuous stall	M_0	**Nm**	2.12			
	Peak stall	M_{max}	**Nm**	4.14		6.8	
Nominal operating point	Nominal torque		**Nm**	1.9	1.7	1.76	
	Nominal speed		**rpm**	2500	6000	4500	
Maximum current			**A rms**	20.6			

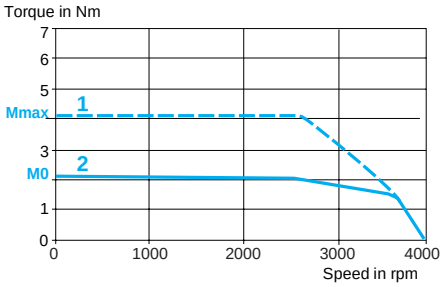
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000	
Constants (at 120°C)	Torque		**Nm/A rms**	0.42	
	Back emf		**V_{rms}/krpm**	28	
Rotor	Number of poles			6	
	Inertia	Without brake J_m	**kgcm²**	0.41	
		With brake J_m	**kgcm²**	0.482	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1.5	
	Inductance (phase/phase)		**mH**	6.6	
	Electrical time constant		**ms**	4.4	
Holding brake (depending on model)				See page 86	

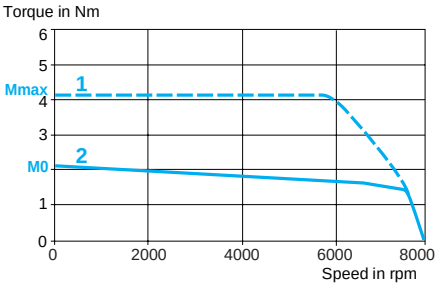
Speed/torque curves

BSH 0702T servo motor

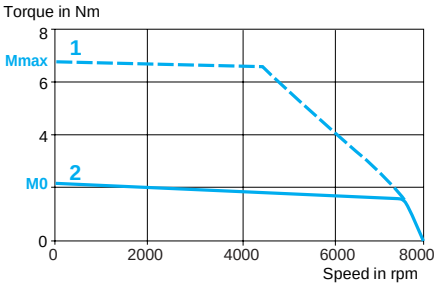
With LXM 05●D17F1 servo drive
115 V single phase



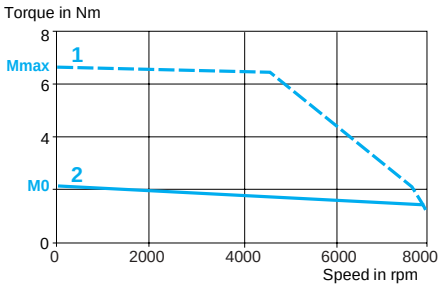
With LXM 05●D17M2 servo drive
230 V single phase



With LXM 05●D28M2 servo drive
230 V single phase



With LXM 05●D42M3X servo drive 230 V 3-phase



1 Peak torque
2 Continuous torque

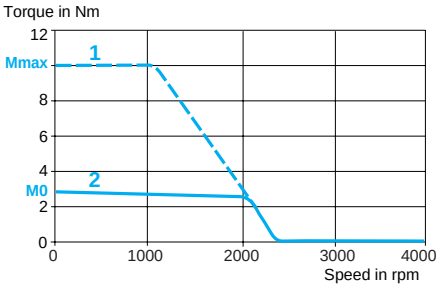
Characteristics of BSH 0703M servo motors

Type of servo motor				BSH 0703M		
Associated with Lexium 05 servo drive				**LXM 05●D10M2**	**LXM 05●D10M3X**	**LXM 05●D14N4**
Line supply voltage			**V**	230 single phase	230 3-phase	400/480 3-phase
Switching frequency			**kHz**	4		
Torque	Continuous stall	M_0	**Nm**	2.8		
	Peak stall	M_{max}	**Nm**	10		10.3
Nominal operating point	Nominal torque		**Nm**	2.7		2.5
	Nominal speed		**rpm**	1500		3000
Maximum current			**A rms**	7.3		
Servo motor characteristics						
Maximum mechanical speed			**rpm**	8000		
Constants (at 120°C)	Torque		**Nm/A rms**	1.48		
	Back emf		**V_{rms}/krpm**	96		
Rotor	Number of poles			6		
	Inertia	Without brake J_m	**kgcm²**	0.58		
		With brake J_m	**kgcm²**	0.81		
Stator (at 20°C)	Resistance (phase/phase)		Ω	10.7		
	Inductance (phase/phase)		**mH**	48.1		
	Electrical time constant		**ms**	4.5		
Holding brake (depending on model)				See page 86		

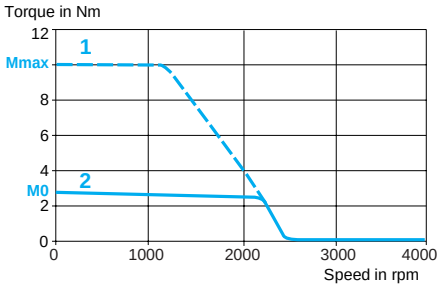
Speed/torque curves

BSH 0703M servo motor

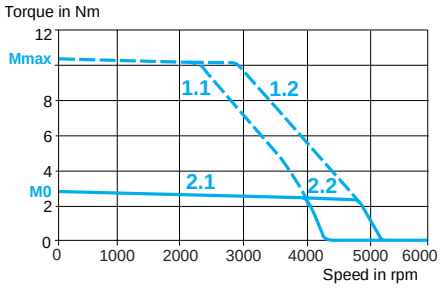
With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



With LXM 05●D14N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase

1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Presentation: page 54
References: pages 80 to 82
Dimensions: pages 83 to 85

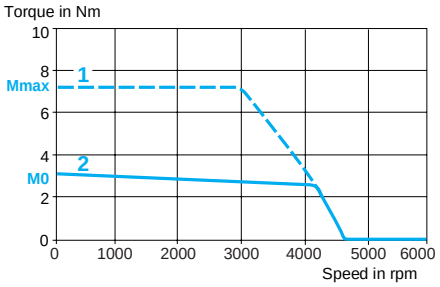
Characteristics of BSH 0703P servo motors

Type of servo motor				BSH 0703P			
Associated with Lexium 05 servo drive				**LXM 05 ●D17M2**	**LXM 05 ●D28M2**	**LXM 05 ●D17M3X**	**LXM 05 ●D22N4**
Line supply voltage			**V**	230 single phase	230 single phase	230 3-phase	400/480 3-phase
Switching frequency			**kHz**	8			
Torque	Continuous stall	M_0	**Nm**	3.1			
	Peak stall	M_{max}	**Nm**	7.28	10.3	7.28	8.92
Nominal operating point	Nominal torque		**Nm**	2.8	2.3	2.8	2.3
	Nominal speed		**rpm**	3000			6000
Maximum current			**A rms**	15.2			
Servo motor characteristics							
Maximum mechanical speed			**rpm**	8000			
Constants (at 120°C)	Torque		**Nm/A rms**	0.78			
	Back emf		**V_{rms}/krpm**	49			
Rotor	Number of poles			6			
	Inertia	Without brake J_m	**kgcm²**	0.58			
		With brake J_m	**kgcm²**	0.81			
Stator (at 20°C)	Resistance (phase/phase)		Ω	2.7			
	Inductance (phase/phase)		**mH**	13			
	Electrical time constant		**ms**	4.81			
Holding brake (depending on model)				See page 86			

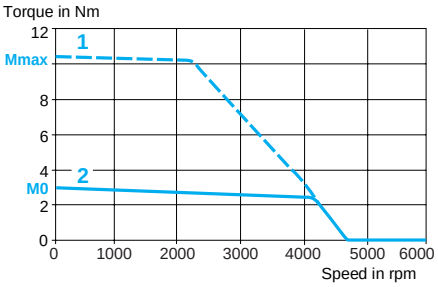
Speed/torque curves

BSH 0703P servo motor

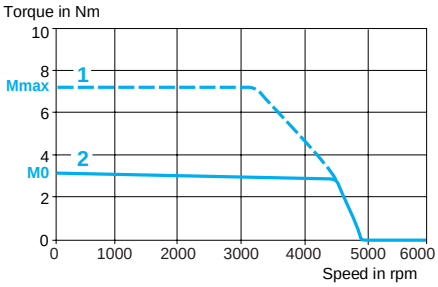
With LXM 05●D17M2 servo drive
230 V single phase



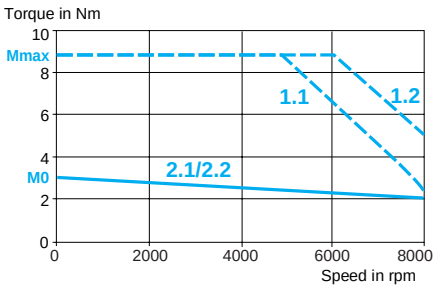
With LXM 05●D28M2 servo drive
230 V single phase



With LXM 05●D17M3X servo drive
230 V 3-phase



With LXM 05●D22N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase

1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

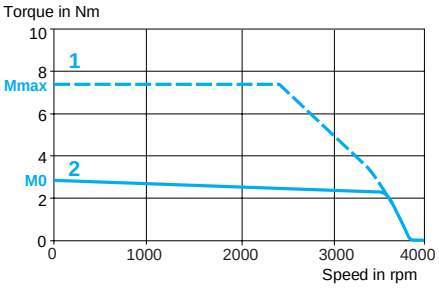
Characteristics of BSH 0703T servo motors

Type of servo motor				BSH 0703T		
Associated with Lexium 05 servo drive				**LXM 05●D28F1**	**LXM 05●D28M2**	**LXM 05●D42M3X**
Line supply voltage			**V**	115 single phase	230 single phase	230 3-phase
Switching frequency			**kHz**	8		
Torque	Continuous stall	M_0	**Nm**	2.8		
	Peak stall	M_{max}	**Nm**	7.38		10.25
Nominal operating point	Nominal torque		**Nm**	2.55	2.1	
	Nominal speed		**rpm**	2500	6000	
Maximum current			**A rms**	30.9		
Servo motor characteristics						
Maximum mechanical speed			**rpm**	8000		
Constants (at 120°C)	Torque		**Nm/A rms**	0.42		
	Back emf		**V_{rms}/krpm**	29		
Rotor	Number of poles			6		
	Inertia	Without brake J_m	**kgcm²**	0.58		
		With brake J_m	**kgcm²**	0.81		
Stator (at 20°C)	Resistance (phase/phase)		Ω	1		
	Inductance (phase/phase)		**mH**	4.4		
	Electrical time constant		**ms**	4.4		
Holding brake (depending on model)				See page 86		

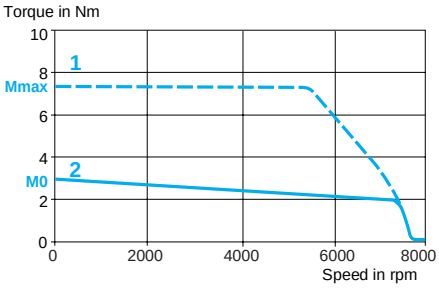
Speed/torque curves

BSH 0703T servo motor

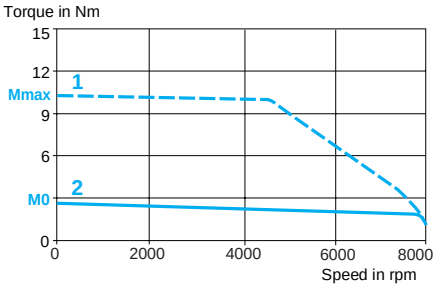
With LXM 05●D28F1 servo drive
115 V single phase



With LXM 05●D28M22 servo drive
230 V single phase



With LXM 05●D42M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Characteristics of 1001M/1001P servo motors

Type of servo motor				BSH 1001M	BSH 1001P	
Associated with Lexium 05 servo drive				LXM 05 ●D14N4	LXM 05 ●D17M3X	LXM 05 ●D22N4
Line supply voltage			**V**	400/480 3-phase	230 3-phase	400/480 3-phase
Switching frequency			**kHz**	4		
Torque	Continuous stall	M_0	**Nm**	3.4	3.3	
	Peak stall	M_{max}	**Nm**	8.5	9.45	
Nominal operating point	Nominal torque		**Nm**	3.1		2.8
	Nominal speed		**rpm**	2000		4000
Maximum current			**A rms**	5.9	12	

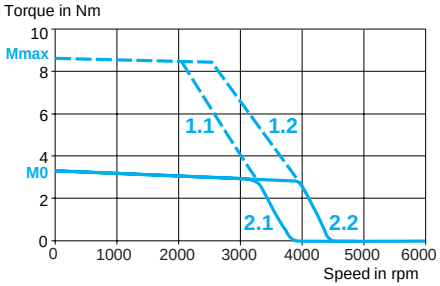
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000		
Constants (at 120°C)	Torque		**Nm/A rms**	1.84	0.89	
	Back emf		**V_{rms}/krpm**	112	60	
Rotor	Number of poles			8		
	Inertia	Without brake J_m	**kgcm²**	1.40		
		With brake J_m	**kgcm²**	2.013		
Stator (at 20°C)	Resistance (phase/phase)		Ω	18.4	3.8	
	Inductance (phase/phase)		**mH**	61.5	17.6	
	Electrical time constant		**ms**	3.34	4.63	
Holding brake (depending on model)				See page 86		

Speed/torque curves

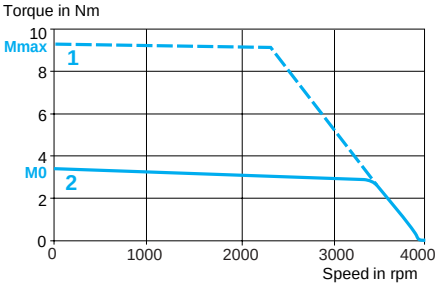
BSH 1001M servo motor

With LXM 05●D14N4 servo drive
400/480 V 3-phase

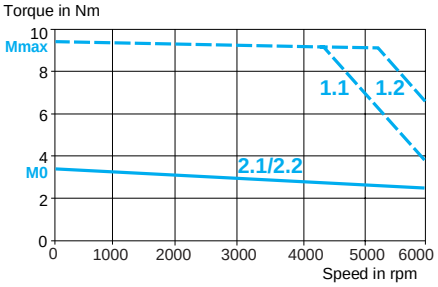


BSH 1001P servo motor

With LXM 05●D17M3X servo drive
230 V 3-phase



With LXM 05●D22N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase

1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Characteristics of BSH 1001T servo motors

Type of servo motor				BSH 1001T		
Associated with Lexium 05 servo drive				LXM 05 ●D28F1	LXM 05 ●D28M2	LXM 05 ●D42M3X
Line supply voltage			V	115 single phase	230 single phase	230 3-phase
Switching frequency			kHz	8		
Torque	Continuous stall	M_0	Nm	3.4		
	Peak stall	M_{max}	Nm	8.5		
Nominal operating point	Nominal torque		Nm	3	2.8	
	Nominal speed		rpm	2500	4000	
Maximum current			A rms	23		

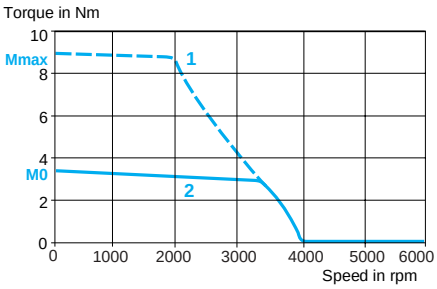
Servo motor characteristics

Maximum mechanical speed			rpm	6000
Constants (at 120°C)	Torque		Nm/A rms	0.52
	Back emf		V_{rms}/krpm	28
Rotor	Number of poles			8
	Inertia	Without brake J_m	kgcm²	1.40
		With brake J_m	kgcm²	2.013
Stator (at 20°C)	Resistance (phase/phase)		Ω	0.9
	Inductance (phase/phase)		mH	4
	Electrical time constant		ms	4.44
Holding brake (depending on model)				See page 86

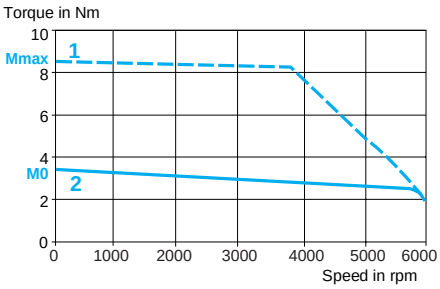
Speed/torque curves

BSH 1001T servo motor

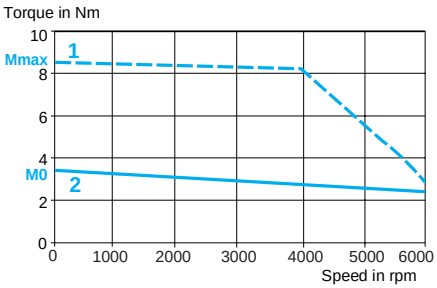
With LXM 05●D28F1 servo drive
115 V single phase



With LXM 05●D28M2 servo drive
230 V single phase



With LXM 05●D42M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

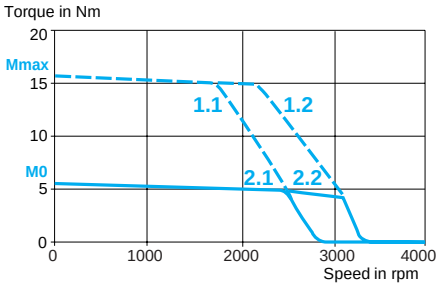
Characteristics of BSH 1002M/1002P/1002T servo motors

Type of servo motor				BSH 1002M	BSH 1002P			BSH 1002T
Associated with Lexium 05 servo drive				LXM 05 ●D14N4	LXM 05 ●D28M2	LXM 05 ●D17M3X	LXM 05 ●D22N4	LXM 05 ●D42M3X
Line supply voltage			V	400/480 3-phase	230 single phase	230 3-phase	400/480 3-phase	230 3-phase
Switching frequency			kHz	4	8			
Torque	Continuous stall	M_0	Nm	5.5	5.8			5.52
	Peak stall	M_{max}	Nm	16	18.23	12.35	15.43	16
Nominal operating point	Nominal torque		Nm	5.1	5.2		4.6	4.4
	Nominal speed		rpm	2000			4000	
Maximum current			A rms	7.4	17.8			31.2
Servo motor characteristics								
Maximum mechanical speed			rpm	6000				
Constants (at 120°C)	Torque		Nm/A rms	2.28	1.21			0.65
	Back emf		V_{rms}/krpm	146	77			33
Rotor	Number of poles			8				
	Inertia	Without brake J_m	$kgcm^2$	2.31				
		With brake J_m	$kgcm^2$	2.923				
Stator (at 20°C)	Resistance (phase/phase)		Ω	8.6	2.4			0.6
	Inductance (phase/phase)		mH	46.1	12.7			2.9
	Electrical time constant		ms	5.98	5.91			6.00
Holding brake (depending on model)				See page 86				

Speed/torque curves

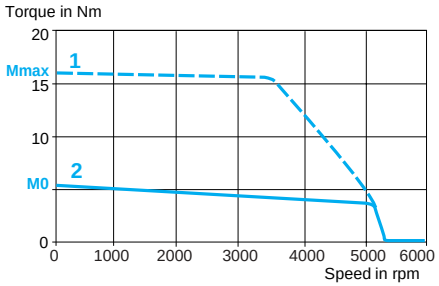
BSH 1002M servo motor

With LXM 05●D14N4 servo drive
400/480 V 3-phase



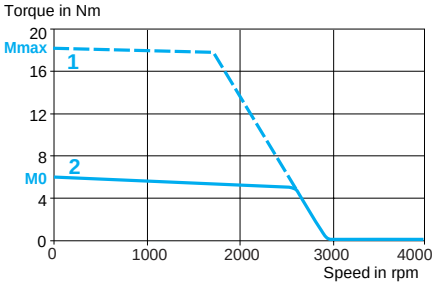
BSH 1002T servo motor

With LXM 05●D17M3X servo drive
230 V 3-phase

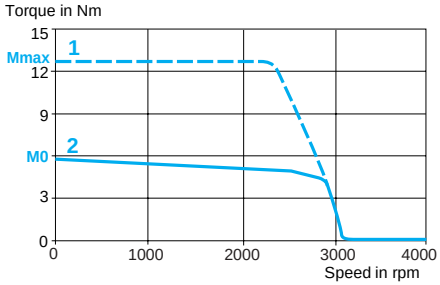


BSH 1002P servo motor

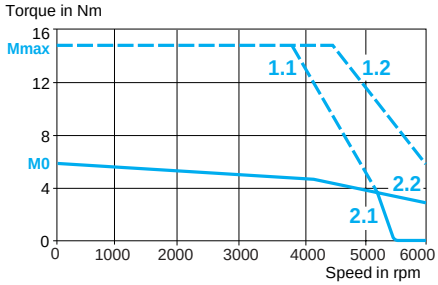
With LXM 05●D28M2 servo drive
230 V single phase



With LXM 05●D17M3X servo drive
230 V 3-phase



With LXM 05●D22N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase

1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Presentation: page 54
References: pages 80 to 82
Dimensions: pages 83 to 85

Lexium 05 motion control
BSH servo motors

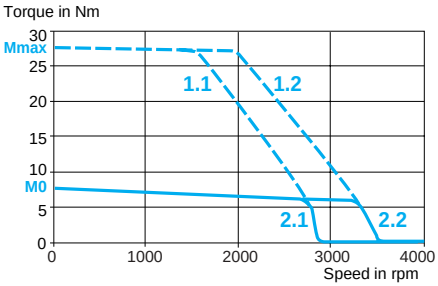
Characteristics of BSH 1003M/1003P servo motors

Type of servo motor				BSH 1003M	BSH 1003P		
Associated with Lexium 05 servo drive				LXM 05 ●D22N4	LXM 05 ●D28M2	LXM 05 ●D42M3X	LXM 05 ●D34N4
Line supply voltage			V	400/480 3-phase	230 single phase	230 3-phase	400/480 3-phase
Switching frequency			kHz	4			
Torque	Continuous stall	M_0	Nm	7.8	8		
	Peak stall	M_{max}	Nm	27.28	22.79	28.31	26.97
Nominal operating point	Nominal torque		Nm	6.6	7		5.7
	Nominal speed		rpm	2000			4000
Maximum current			A rms	15.6	28.3		
Servo motor characteristics							
Maximum mechanical speed			rpm	6000			
Constants (at 120°C)	Torque		Nm/A rms	2.24	1.12		
	Back emf		V_{rms}/krpm	144	77		
Rotor	Number of poles			8			
	Inertia	Without brake J_m	$kgcm^2$	3.22			
		With brake J_m	$kgcm^2$	3.833			
Stator (at 20°C)	Resistance (phase/phase)		Ω	5.3	1.43		
	Inductance (phase/phase)		mH	33.7	8.8		
	Electrical time constant		ms	6.36	6.15		
Holding brake (depending on model)				See page 86			

Speed/torque curves

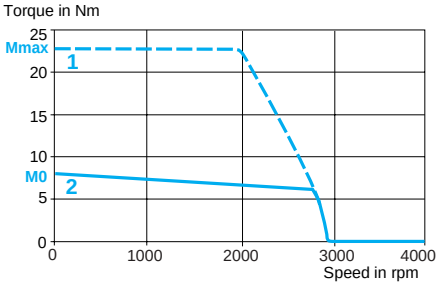
BSH 1003M servo motor

With LXM 05●D22N4 servo drive
400/480 V 3-phase

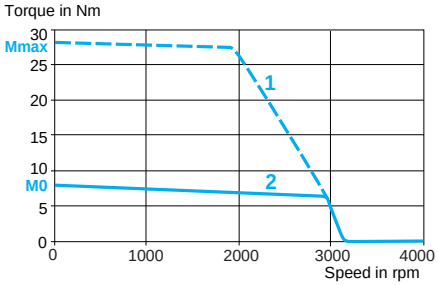


BSH 1003P servo motor

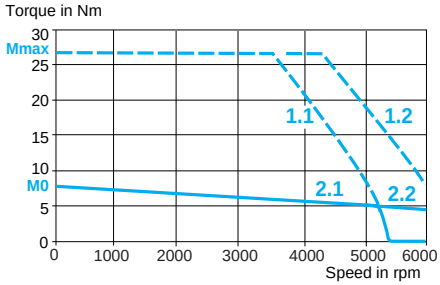
With LXM 05●D28M2 servo drive
230 V single phase



With LXM 05●D42M3X servo drive
230 V 3-phase



With LXM 05●D34N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase

1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Presentation: page 54
References: pages 80 to 82
Dimensions: pages 83 to 85

Characteristics of BSH 1004P servo motors

Type of servo motor				**BSH 1004P**		
Associated with Lexium 05 servo drive				**LXM 05●D42M3X**	**LXM 05●D34N4**	**LXM 05●D57N4**
Line supply voltage			**V**	230 3-phase	400/480 3-phase	400/480 3-phase
Switching frequency			**kHz**	8		
Torque	Continuous stall	M_0	**Nm**	10		
	Peak stall	M_{max}	**Nm**	30.41	22.53	30.41
Nominal operating point	Nominal torque		**Nm**	9.5	7.9	7.9
	Nominal speed		**rpm**	1500	3000	3000
Maximum current			**A rms**	23.5		

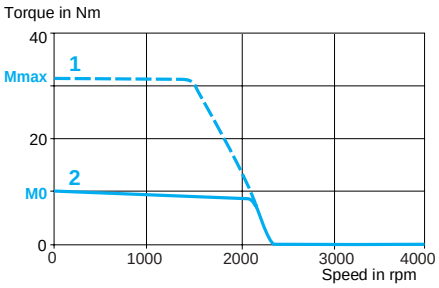
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000		
Constants (at 120°C)	Torque		**Nm/A rms**	1.62		
	Back emf		**V_{rms}/krpm**	103		
Rotor	Number of poles			8		
	Inertia	Without brake J_m	**kgcm²**	4.22		
		With brake J_m	**kgcm²**	5.245		
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1.81		
	Inductance (phase/phase)		**mH**	11.8		
	Electrical time constant		**ms**	6.52		
Holding brake (depending on model)				See page 86		

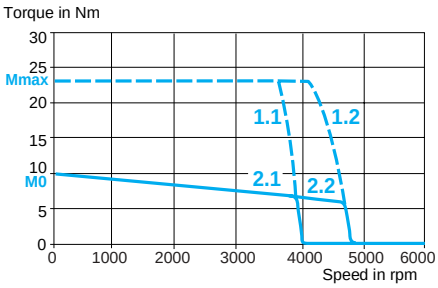
Speed/torque curves

BSH 1004P servo motor

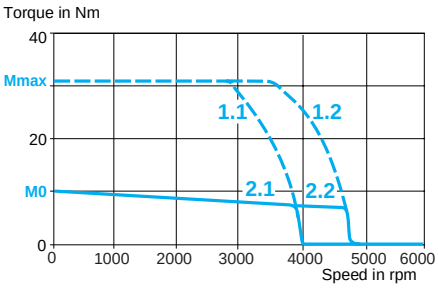
With LXM 05●D42M3X servo drive
230 V 3-phase



With LXM 05●D34N4 servo drive
400/480 V 3-phase



With LXM 05●D57N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase

1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

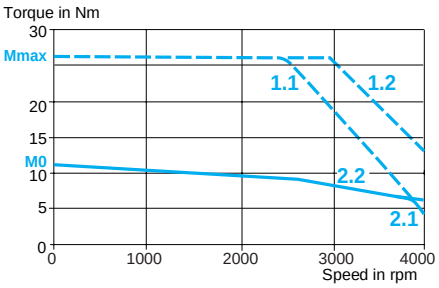
Characteristics of BSH 1401P/1401T servo motors

Type of servo motor				BSH 1401P	BSH 1401T
Associated with Lexium 05 servo drive				**LXM 05●D34N4**	**LXM 05●D42M3X**
Line supply voltage			**V**	400/480 3-phase	230 3-phase
Switching frequency			**kHz**	4	
Torque	Continuous stall	M_0	**Nm**	11.1	
	Peak stall	M_{max}	**Nm**	26.2	24.77
Nominal operating point	Nominal torque		**Nm**	9.55	9.47
	Nominal speed		**rpm**	2500	
Maximum current			**A rms**	20.8	37.1
Servo motor characteristics					
Maximum mechanical speed			**rpm**	4000	
Constants (at 120°C)	Torque		**Nm/A rms**	1.43	0.8
	Back emf		**V_{rms}/krpm**	100	56
Rotor	Number of poles			10	
	Inertia	Without brake J_m	**kgcm²**	7.41	
		With brake J_m	**kgcm²**	8.56	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1.41	0.44
	Inductance (phase/phase)		**mH**	15.6	4.92
	Electrical time constant		**ms**	11.06	11.18
Holding brake (depending on model)				See page 86	

Speed/torque curves

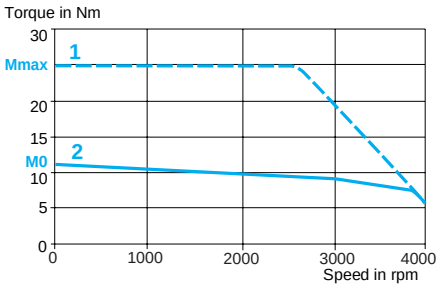
BSH 1401P servo motor

With LXM 05●D34N4 servo drive
400/480 V 3-phase



BSH 1401T servo motor

With LXM 05●D42M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase

1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Presentation: page 54
References: pages 80 to 82
Dimensions: pages 83 to 85

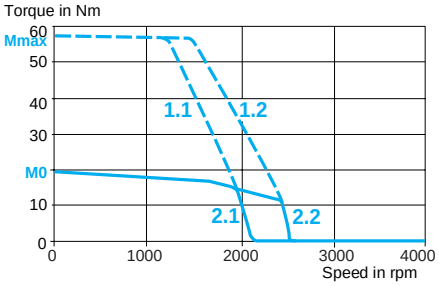
Characteristics of BSH 1402M/1402P/1402T servo motors

Type of servo motor				BSH 1402M	BSH 1402P		BSH 1402T
Associated with Lexium 05 servo drive				LXM 05 ●D34N4	LXM 05 ●D42M3X	LXM 05 ●D57N4	LXM 05 ●D42M3X
Line supply voltage			**V**	400/480 3-phase	230 3-phase	400/480 3-phase	230 3-phase
Switching frequency			**kHz**	4			
Torque	Continuous stall	M_0	**Nm**	19.5			
	Peak stall	M_{max}	**Nm**	57.1	46.72	57.42	25.04
Nominal operating point	Nominal torque		**Nm**	17.1	13.7	12.3	14.44
	Nominal speed		**rpm**	1250	1500	3000	2000
Maximum current			**A rms**	22.4	44.1		75.2
Servo motor characteristics							
Maximum mechanical speed			**rpm**	4000			
Constants (at 120°C)	Torque		**Nm/A rms**	2.91	1.47		0.87
	Back emf		**V_{rms}/krpm**	199	101		59
Rotor	Number of poles			10			
	Inertia	Without brake J_m	**kgcm²**	12.68			
		With brake J_m	**kgcm²**	13.83			
Stator (at 20°C)	Resistance (phase/phase)		Ω	2.32	0.6		0.21
	Inductance (phase/phase)		**mH**	28.59	7.4		2.54
	Electrical time constant		**ms**	12.32	12.33		12.2
Holding brake (depending on model)				See page 86			

Speed/torque curves

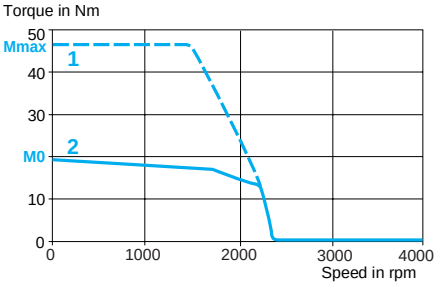
BSH 1402M servo motor

With LXM 05●D34N4 servo drive
400/480 V 3-phase

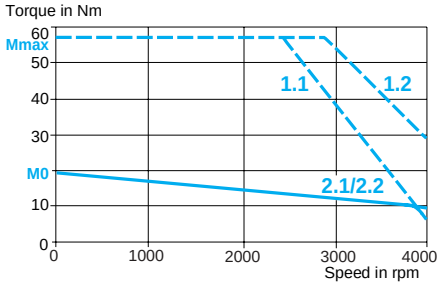


BSH 1402P servo motor

With LXM 05●D42M3X servo drive
230 V 3-phase

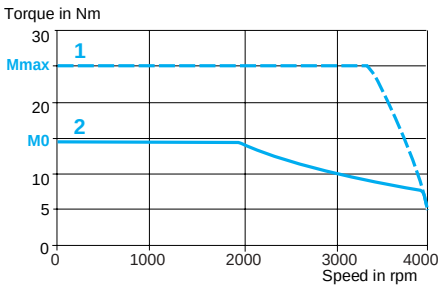


With LXM 05●D57N4 servo drive
400/480 V 3-phase



BSH 1402T servo motor

With LXM 05●D42M3X servo drive 230 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase

1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Presentation: page 54
References: pages 80 to 82
Dimensions: pages 83 to 85

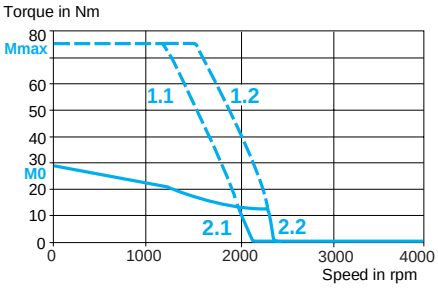
Characteristics of BSH 1403M/1403P servo motors

Type of servo motor				BSH 1403M		BSH 1403P
Associated with Lexium 05 servo drive				**LXM 05●D34N4**	**LXM 05●D57N4**	**LXM 05●D57N4**
Line supply voltage			**V**	400/480 3-phase		
Switching frequency			**kHz**	4		
Torque	Continuous stall	M_0	**Nm**	27.8		
	Peak stall	M_{max}	**Nm**	76.66	88.17	57.24
Nominal operating point	Nominal torque		**Nm**	21.5	21.2	12.9
	Nominal speed		**rpm**	1250	1500	3000
Maximum current			**A rms**	27.5		75.2
Servo motor characteristics						
Maximum mechanical speed			**rpm**	4000		
Constants (at 120°C)	Torque		**Nm/A rms**	3.09		1.58
	Back emf		**V_{rms}/krpm**	205		105
Rotor	Number of poles			10		
	Inertia	Without brake J_m	**kgcm²**	17.94		
		With brake J_m	**kgcm²**	23.44		
Stator (at 20°C)	Resistance (phase/phase)		Ω	1.52		0.4
	Inductance (phase/phase)		**mH**	19.39		5.1
	Electrical time constant		**ms**	12.76		12.75
Holding brake (depending on model)				See page 86		

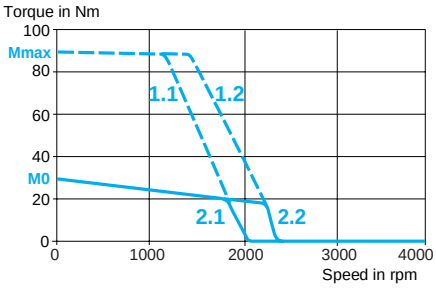
Speed/torque curves

BSH 1403M servo motor

With LXM 05●D34N4 servo drive
400/480 V 3-phase

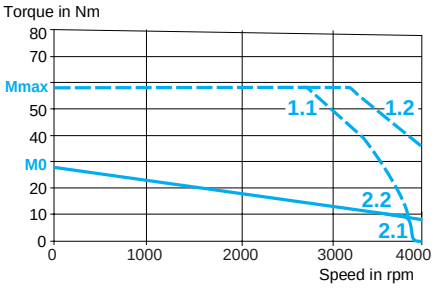


With LXM 05●D57N4 servo drive
400/480 V 3-phase



BSH 1403P servo motor

With LXM 05●D57N4 servo drive
400/480 V 3-phase



1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Presentation: page 54
References: pages 80 to 82
Dimensions: pages 83 to 85

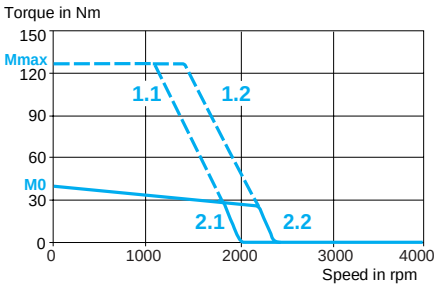
Characteristics of BSH 1404M/1404P servo motors

Type of servo motor				BSH 1404M	BSH 1404P
Associated with Lexium 05 servo drive				**LXM 05●D57N4**	
Line supply voltage			**V**	400/480 3-phase	
Switching frequency			**kHz**	4	
Torque	Continuous stall	M_0	**Nm**	33.4	
	Peak stall	M_{max}	**Nm**	126.45	60.04
Nominal operating point	Nominal torque		**Nm**	26.3	16.1
	Nominal speed		**rpm**	1500	3000
Maximum current			**A rms**	47.8	95.6
Servo motor characteristics					
Maximum mechanical speed			**rpm**	4000	
Constants (at 120°C)	Torque		**Nm/A rms**	3.12	1.57
	Back emf		**V_{rms}/krpm**	208	104
Rotor	Number of poles			10	
	Inertia	Without brake J_m	**kgcm²**	23.70	
		With brake J_m	**kgcm²**	29.20	
Stator (at 20°C)	Resistance (phase/phase)		Ω	1.12	0.28
	Inductance (phase/phase)		**mH**	15.6	3.9
	Electrical time constant		**ms**	13.93	
Holding brake (depending on model)				See page 86	

Speed/torque curves

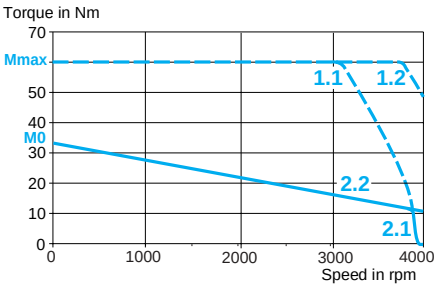
BSH 1404M servo motor

With LXM 05●D57N4 servo drive
400/480 V 3-phase



BSH 1404P servo motor

With LXM 05●D57N4 servo drive
400/480 V 3-phase



1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

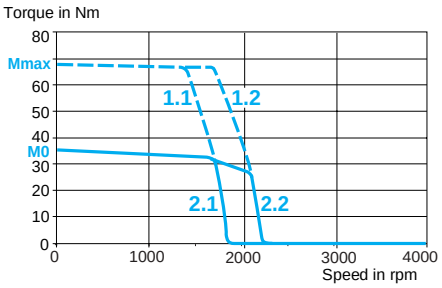
Characteristics of BSH 2051M servo motors

Type of servo motor				BSH 2051M
Associated with Lexium 05 servo drive				**LXM 05●D57N4**
Line supply voltage			**V**	400/480 3-phase
Switching frequency			**kHz**	4
Torque	Continuous stall	M_0	**Nm**	36
	Peak stall	M_{max}	**Nm**	68.3
Nominal operating point	Nominal torque		**Nm**	33.5
	Nominal speed		**rpm**	1500
Maximum current			**A rms**	31.8
Servo motor characteristics				
Maximum mechanical speed			**rpm**	3800
Constants (at 120°C)	Torque		**Nm/A rms**	3.16
	Back emf		**V_{rms}/krpm**	208
Rotor	Number of poles			10
	Inertia	Without brake J_m	**kgcm²**	62
		With brake J_m	**kgcm²**	78
Stator (at 20°C)	Resistance (phase/phase)		Ω	1.6
	Inductance (phase/phase)		**mH**	15.2
	Electrical time constant		**ms**	9.50
Holding brake (depending on model)				See page 86

Speed/torque curves

BSH 2051M servo motor

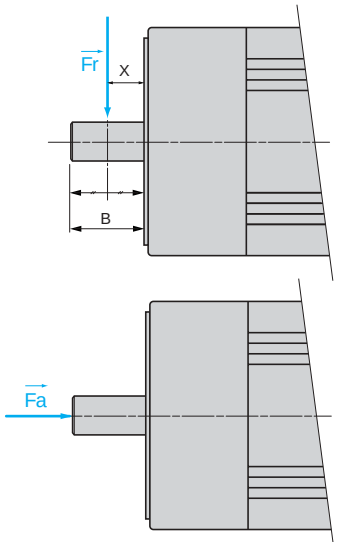
With LXM 05●D57N4 servo drive
400/480 V 3-phase



1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Presentation: page 54
References: pages 80 to 82
Dimensions: pages 83 to 85

Lexium 05 motion control
BSH servo motors



Radial and axial forces permissible on the motor shaft

Even when the servo motors are used under optimum conditions, their lifetime is limited by that of the bearings.

Conditions	
Nominal lifetime of bearings *(1)*	L_{10h} = 20,000 hours
Ambient temperature (temperature of bearings ~ 100°C)	40°C
Force application point	Fr applied at the middle of the shaft end X = B/2 (dimension B see pages 83 to 85)

(1) Hours of use with 10% probability of failure

The following conditions must be observed:

- Radial and axial forces must not be applied simultaneously.
- Shaft end with IP 40 or IP 65 protection.
- The bearings cannot be changed by the user as the built-in position sensor has to be realigned if the unit is dismantled.

			Maximum radial force Fr							
Mechanical speed		**rpm**	**1000**	**2000**	**3000**	**4000**	**5000**	**6000**	**7000**	**8000**
Servo motor	BSH 0551	**N**	340	270	240	220	200	190	180	170
	BSH 0552	**N**	370	290	260	230	220	200	190	190
	BSH 0553	**N**	390	310	270	240	230	210	200	190
	BSH 0701	**N**	660	520	460	410	380	360	–	–
	BSH 0702	**N**	710	560	490	450	410	390	–	–
	BSH 0703	**N**	730	580	510	460	430	400	–	–
	BSH 1001	**N**	900	720	630	570	530	–	–	–
	BSH 1002	**N**	990	790	690	620	–	–	–	–
	BSH 1003	**N**	1050	830	730	660	–	–	–	–
	BSH 1004	**N**	1070	850	740	–	–	–	–	–
	BSH 1401	**N**	2210	1760	1530	–	–	–	–	–
	BSH 1402	**N**	2430	1930	1680	–	–	–	–	–
	BSH 1403	**N**	2560	2030	1780	–	–	–	–	–
	BSH 1404	**N**	2660	2110	1840	–	–	–	–	–
	BSH 2051	**N**	3730	2960	2580	–	–	–	–	–
			Maximum axial force: Fa = 0.2 x Fr							

Characteristics of servo motor-servo drive power connection cables

		VW3 M5 101R●●●	**VW3 M5 102R●●●**	**VW3 M5 103R●●●**
Outer cover, insulation		PUR (RAL 2003 orange), TPM or PP/PE		
Capacity	**pF/m**	< 70 (conductors/shielding)		
Number of conductors (shielded)		[(4 x 1.5 mm^2) + (2 x 1.0 mm^2)]	[(4 x 2.5 mm^2) + (2 x 1.0 mm^2)]	[(4 x 4 mm^2) + (2 x 1.0 mm^2)]
Connectors		1 industrial connector (motor side) and 1 end with flying leads (drive side)		
External diameter	**mm**	12 ± 0.2	14.3 ± 0.3	16.3 ± 0.3
Curvature radius	**mm**	90, suitable for daisy-chain, cable carrier chain	110, suitable for daisy-chain, cable carrier chain	125, suitable for daisy-chain, cable carrier chain
Operating voltage	**V**	600		
Maximum length	**m**	75 *(1)*		
Operating temperature	**°C**	- 40…+ 90 (fixed), - 20…+ 80 (mobile)		
Certifications		UL, CSA, VDE, CE, DESINA		

Characteristics of servo motor-servo drive encoder connection cables

		VW3 M8 101R●●●
Encoder type		**SinCos encoder**
Outer cover, insulation		PUR (RAL 6018 green), polyester
Number of conductors (shielded)		5 x (2 x 0.25 mm^2) + (2 x 0.5 mm^2)
External diameter	**mm**	8.8 ± 0.2
Connectors		1 industrial connector (motor side) and 1 x 12-way Molex connector (drive side)
Min. curvature radius	**mm**	68, suitable for daisy-chain, cable carrier chain
Operating voltage	**V**	350 (0.25 mm^2), 500 (0.5 mm^2)
Maximum length	**m**	75 *(1)*
Operating temperature	**°C**	- 50…+ 90 (fixed) - 40…+ 80 (mobile)
Certifications		UL, CSA, VDE, CE, DESINA

(1) For cables longer than 75 m, please consult your Regional Sales Office.

Presentation: page 54 References: page 82 Dimensions: pages 83 to 85

Lexium 05 motion control
BSH servo motors

105222

BSH 070●● ●●●1A

105223

BSH 070●● ●●●2A

BSH servo motors

The BSH servo motors shown below are supplied without a gearbox.
For GBX gearboxes, see page 90.

Continuous stall torque	Peak stall torque	Maximum mechanical speed	Associated servo drive LXM 05●	Maximum nominal speed *(1)*	Reference *(2)*	Weight *(3)*
Nm	**Nm**	**rpm**		**rpm**		**kg**
0.5	1.4	9000	D10F1	3000	**BSH 0551T ●●●●A**	0.800
			D10M2	6000		
			D10M3X	6000		
0.9	1.77	9000	D10F1	3000	**BSH 0552T ●●●●A**	1.100
			D10M2	6000		
			D10M3X	6000		
	2.3	9000	D10M2	1500	**BSH 0552M ●●●●A**	1.100
			D10M3X	1500		
	2.7	9000	D17F1	3000	**BSH 0552T ●●●●A**	1.100
			D10M2	4000	**BSH 0552P ●●●●A**	1.100
			D10M3X	4000		
			D14N4	6000		
1.3	3.18	9000	D10M2	4000	**BSH 0553P ●●●●A**	1.400
			D10M3X	4000		
	3.31	9000	D17F1	3000	**BSH 0553T ●●●●A**	1.400
			D17M2	6000		
			D17M3X	6000		
	3.87	9000	D14N4	6000	**BSH 0553T ●●●●A**	1.400
	4.2	9000	D10M2	1500	**BSH 0553M ●●●●A**	1.400
			D10M3X	1500		
1.4	2.41	8000	D10M3X	6000	**BSH 0701T ●●●●A**	2.100
	2.42	8000	D10F1	2500		
	3.19	8000	D17M3X	5000		
			D17M2	5000		
	3.2	8000	D10M3X	1500	**BSH 0701M ●●●●A**	2.100
			D10M2	3000	**BSH 0701P ●●●●A**	2.100
			D10M3X	4500		
2.1	6.8	8000	D10M2	1500	**BSH 0702M ●●●●A**	2.800
			D10M3X	1500		
2.12	4.14	8000	D17F1	2500	**BSH 0702T ●●●●A**	2.800
			D17M2	6000		
	6.8	8000	D28M2	4500		
			D42M3X	4500		
2.2	5.37	8000	D10M2	3000	**BSH 0702P ●●●●A**	2.800
			D10M3X	3000		
	7.55	8000	D14N4	6000		
			D17M2	3000		
			D17M3X	3000		
2.8	7.38	8000	D28F1	2500	**BSH 0703T ●●●●A**	3.600
			D28M2	6000		
	10	8000	D10M2	1500	**BSH 0703M ●●●●A**	3.600
			D10M3X	1500		
	10.25	8000	D42M3X	6000	**BSH 0703T ●●●●A**	3.600
	10.3		D14N4	3000	**BSH 0703M ●●●●A**	3.600
3.1	7.28	8000	D17M2	3000	**BSH 0703P ●●●●A**	3.600
			D17M3X	3000		
	8.92	8000	D22N4	6000		
	10.3	8000	D28M2	3000		

(1) Derating possible according to the supply voltage, see characteristics on pages 56 to 78.
(2) To complete each reference, see the table opposite.
(3) Servo motor weight without brake. To obtain the weight of the servo motor with holding brake, see page 86.

Presentation: pages 54 and 55
Characteristics: pages 56 to 78
Dimensions: pages 83 to 85

Lexium 05 motion control
BSH servo motors

BSH servo motors (continued)

105224

BSH 100●● ●●●1A

Continuous stall torque	Peak stall torque	Maximum mechanical speed	Associated servo drive LXM 05●	Maximum nominal speed (1)	Reference (2)	Weight (3)
Nm	Nm	rpm		rpm		kg
3.3	9.45	6000	D17M3X	2000	**BSH 1001P ●●●●A**	4.300
			D22N4	4000		
3.4	8.5	6000	D14N4	2000	**BSH 1001M ●●●●A**	4.300
			D28F1	2500	**BSH 1001T ●●●●A**	4.300
			D28M2	4000		
			D42M3X	4000		
5.5	16	6000	D14N4	2000	**BSH 1002M ●●●●A**	5.800
5.52	16	6000	D42M3X	4000	**BSH 1002T ●●●●A**	5.800
5.8	12.35	6000	D17M3X	2000	**BSH 1002P ●●●●A**	5.800
	15.43	6000	D22N4	4000		
	18.23	6000	D28M2	2000		
7.8	27.8	6000	D22N4	2000	**BSH 1003M ●●●●A**	7.500
8	22.79	6000	D28M2	2000	**BSH 1003P ●●●●A**	7.500
	26.97	6000	D34N4	4000		
	28.31	6000	D42M3X	2000		
10	22.53	6000	D34N4	3000	**BSH 1004P ●●●●A**	9.200
	30.41	6000	D42M3X	1500		
			D57N4	3000		
11.1	24.77	4000	D42M3X	2500	**BSH 1401T ●●●●A**	11.900
	26.2	4000	D34N4	2500	**BSH 1401P ●●●●A**	11.900
14.73	25.04	4000	D42M3X	2000	**BSH 1402T ●●●●A**	16.600
19.5	46.72	4000	D42M3X	1500	**BSH 1402P ●●●●A**	16.600
	57.1	4000	D34N4	1250	**BSH 1402M ●●●●A**	16.600
	57.42	4000	D57N4	3000	**BSH 1402P ●●●●A**	16.600
27.8	57.24	4000	D57N4	3000	**BSH 1403P ●●●●A**	21.300
	76.66	4000	D34N4	1250	**BSH 1403M ●●●●A**	21.300
	88.17	4000	D57N4	1500		
33.4	60.04	4000	D57N4	3000	**BSH 1404P ●●●●A**	26.000
	126.45	4000	D57N4	1500	**BSH 1404M ●●●●A**	26.000
36	68.3	3800	D57N4	1500	**BSH 2051M ●●●●A**	33.000

105230

BSH 140●● ●●●1A

(1) Derating possible according to the supply voltage, see characteristics on pages 56 to 78.
(2) To complete each reference, see the table below.
(3) Servo motor weight without brake. To obtain the weight of the servo motor with holding brake, see page 86.

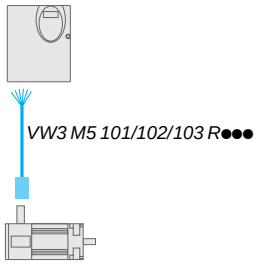
To order a BSH motor, complete each reference as appropriate:

			BSH 0701P	●	●	●	●	A
Shaft end	IP 40	Smooth		**0**				
		Keyed		**1**				
	IP 65	Smooth		**2**				
		Keyed		**3**				
Integrated sensor	Single turn, SinCos Hiperface® 4096 points/turn				**1**			
	Multiturn, SinCos Hiperface® (no. of turns: 4096)				**2**			
Holding brake	Without					**A**		
	With					**F**		
Connection	Straight connectors						**1**	
	Rotatable right-angled connectors						**2**	
Flange	International standard							**A**

Presentation: pages 54 and 55
Characteristics: pages 56 to 78
Dimensions: pages 83 to 85

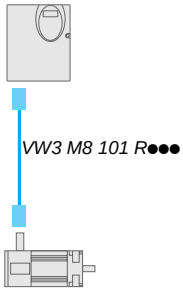
Lexium 05 motion control
BSH servo motor

Connection cables



Cables equipped with one connector (servo motor side)

Description	From servo motor	To LXM 05● servo drive	Composition	Length	Reference	Weight
				m		kg
Power cables	BSH 055●● BSH 070●● BSH 100●● BSH 1401P BSH 1402M BSH 1402P BSH 1403M BSH 1404M	All types	[(4 x 1.5 mm²) + (2 x 1 mm²)]	3	**VW3 M5 101 R30**	0.810
				5	**VW3 M5 101 R50**	1.210
				10	**VW3 M5 101 R100**	2.290
				15	**VW3 M5 101 R150**	3.400
				20	**VW3 M5 101 R200**	4.510
				25	**VW3 M5 101 R250**	6.200
				50	**VW3 M5 101 R500**	12.325
				75	**VW3 M5 101 R750**	18.450
	BSH 1401T BSH 1402T BSH 1403P BSH 1404P	D42M3X D57N4	[(4 x 2.5 mm²) + (2 x 1 mm²)]	3	**VW3 M5 102 R30**	1.070
				5	**VW3 M5 102 R50**	1.670
				10	**VW3 M5 102 R100**	3.210
				15	**VW3 M5 102 R150**	4.760
				20	**VW3 M5 102 R200**	6.300
				25	**VW3 M5 102 R250**	7.945
				50	**VW3 M5 102 R500**	16.170
				75	**VW3 M5 102 R750**	24.095
	BSH 2051M	D57N4	[(4 x 4 mm²) + (2 x 1 mm²)]	3	**VW3 M5 103 R30**	1.330
				5	**VW3 M5 103 R50**	2.130
				10	**VW3 M5 103 R100**	4.130
				15	**VW3 M5 103 R150**	6.120
				20	**VW3 M5 103 R200**	8.090
				25	**VW3 M5 103 R250**	11.625
				50	**VW3 M5 103 R500**	23.175
				75	**VW3 M5 103 R750**	34.725



Cables equipped with two connectors

Description	From servo motor	To LXM 05● servo drive	Composition	Length	Reference	Weight
				m		kg
SinCos Hiperface® encoder cables	BSH, all types	All types	5 x (2 x 0.25 mm²) + (2 x 0.5 mm²)	3	**VW3 M8 101 R30**	0.800
				5	**VW3 M8 101 R50**	1.200
				10	**VW3 M8 101 R100**	2.250
				15	**VW3 M8 101 R150**	3.450
				20	**VW3 M8 101 R200**	4.350
				25	**VW3 M8 101 R250**	4.950
				50	**VW3 M8 101 R500**	13.300
				75	**VW3 M8 101 R750**	17.650

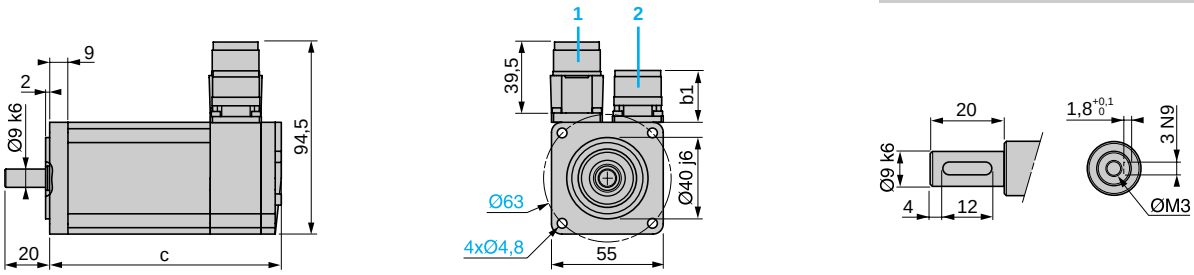
Presentation:
pages 54 and 55

Characteristics:
pages 79

Lexium 05 motion control
BSH servo motors

BSH 055 (Example with straight connectors: servo motor/brake power supply 1 and encoder 2)

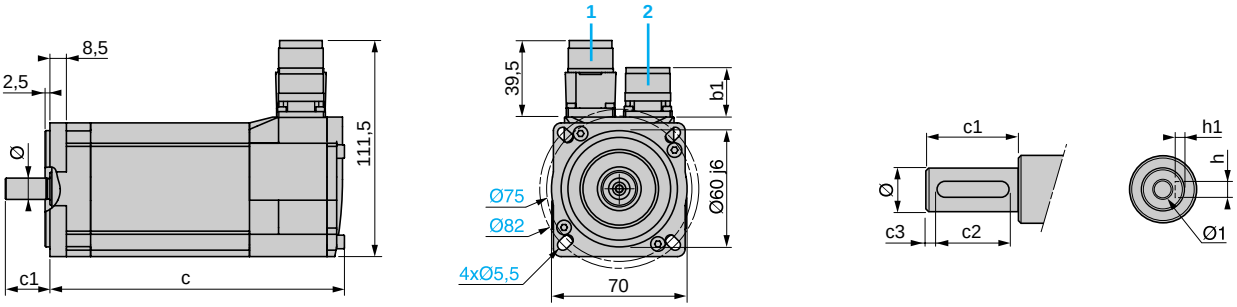
Shaft end, keyed slot (optional)



	Straight connectors	Rotatable angled connectors		
	b1	**b1**	**c** (without brake)	**c** (with brake)
BSH 0551	25.5	39.5	132.5	159
BSH 0552	25.5	39.5	154.5	181
BSH 0553	25.5	39.5	176.5	203

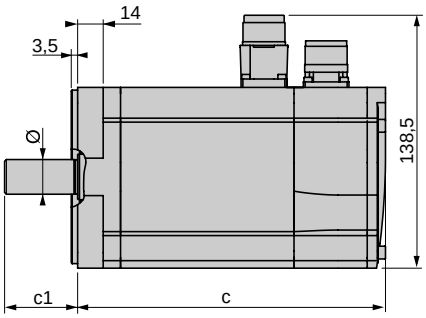
BSH 070 (Example with straight connectors: servo motor/brake power supply 1 and encoder 2)

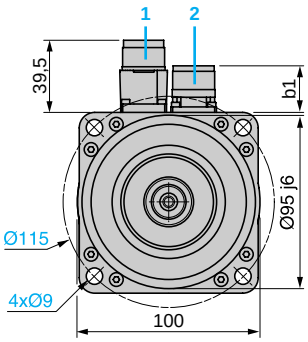
Shaft end, keyed slot (optional)



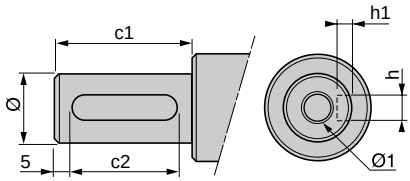
	Straight connectors	Rotatable angled connectors									
	b1	**b1**	**c** (without brake)	**c** (with brake)	**c1**	**c2**	**c3**	**h**	**h1**	**Ø**	**Ø1**
BSH 0701	25.5	39.5	154	180	23	18	2.5	4 N9	2.5 +0.1 0	11 k6	M4
BSH 0702	25.5	39.5	187	213	23	18	2.5	4 N9	2.5 +0.1 0	11 k6	M4
BSH 0703	25.5	39.5	220	256	30	20	5	5 N9	3 +0.1 0	14 k6	M5

BSH 100 (Example with straight connectors: servo motor/brake power supply 1 and encoder 2)



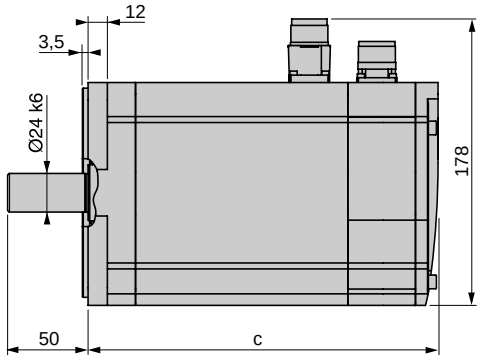


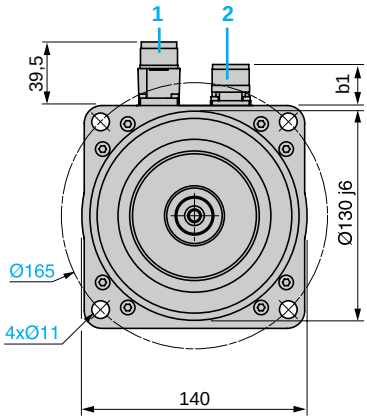
Shaft end, keyed slot (optional)



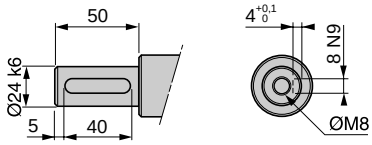
	Straight connectors	Rotatable angled connectors								
	b1	**b1**	**c** (without brake)	**c** (with brake)	**c1**	**c2**	**h**	**h1**	**Ø**	**Ø1**
BSH 1001	25.5	39.5	169	200	40	30	6 N9	3.5 $^{+0.1}_{0}$	19 k6	M6
BSH 1002	25.5	39.5	205	236	40	30	6 N9	3.5 $^{+0.1}_{0}$	19 k6	M6
BSH 1003	25.5	39.5	241	272	40	30	6 N9	3.5 $^{+0.1}_{0}$	19 k6	M6
BSH 1004	25.5	39.5	277	308	50	40	8 N9	4 $^{+0.1}_{0}$	24 k6	M8

BSH 140 (Example with straight connectors: servo motor/brake power supply 1 and encoder 2)





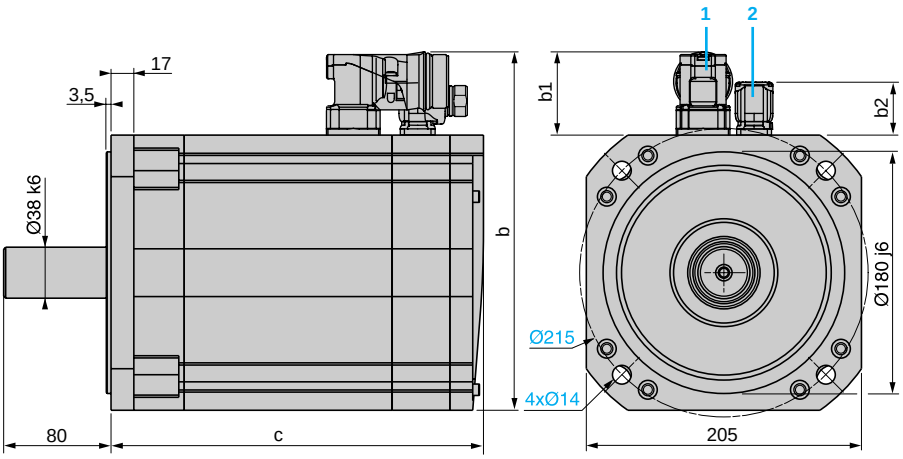
Shaft end, keyed slot (optional)



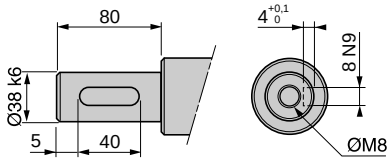
	Straight connectors	Rotatable angled connectors		
	b1	**b1**	**c** (without brake)	**c** (with brake)
BSH 1401	25.5	39.5	218	256
BSH 1402	25.5	39.5	273	311
BSH 1403	25.5	39.5	328	366
BSH 1404	25.5	39.5	383	421

Presentation: pages 54 and 55
Characteristics: pages 56 to 79
References: pages 80 to 82

BSH 2051 (Example with rotatable angled connectors: servo motor/brake power supply **1** and encoder **2**)



Shaft end, keyed slot (optional)

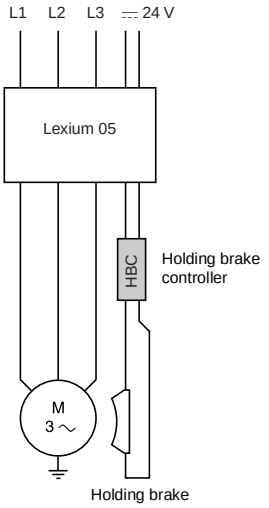


	Straight connectors			Rotatable angled connectors				
	b	**b1**	**b2**	**b**	**b1**	**b2**	**c** (without brake)	**c** (with brake)
BSH 2051	259	54	25.5	267	70	39.5	321	370.5

Lexium 05 motion control
BSH servo motors
Option: holding brake integrated in servo motor

Holding brake

Presentation



The holding brake integrated in the BSH servo motor is an electromagnetic pressure spring brake that blocks the servo motor axis once the motor current has been switched off. In the event of an emergency, such as a power outage or an emergency stop, the drive is immobilized, thus significantly increasing safety. Blocking the servo motor axis is also necessary in cases of torque overload, such as in the case of vertical axis movement.

The holding brake is activated using an external device, the holding brake controller *(HBC)* **VW3 M3 103** (see page 29).

This device also ensures electrical isolation.

Characteristics

Type of servo motor	**BSH**	**0551 0552 0553**	**0701 0702**	**0703**	**1001 1002 1003**	**1004**	**1401 1402**	**1403 1404**	**2051**
Holding torque M_{Br}	**Nm**	0.8	2.0	3.0	9.0	12.0	23	36	80
Rotor moment of inertia (brake only) J_{Br}	**kgcm²**	0.0213	0.072	0.23	0.613	1.025	1.15	5.5	16
Electrical clamping power P_{Br}	**W**	10	11	12	18		24	26	40
Supply voltage	**V**	24 + 6/- 10%							
Opening time	**ms**	12	25	35	40	45	50	100	200
Closing time	**ms**	6	8	15	18	20	25	30	50
Weight (brake only)	**kg**	0.080	0.450	0.320	0.450	0.690	1.100	1.790	3.600

References

BSH servo motor

For selection of BSH servo motor with **F** or without **A** holding brake, see references on page 81.

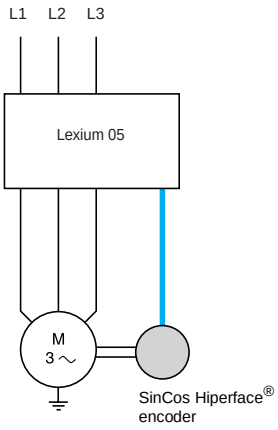
Dimensions:
pages 33, 83 to 85

Schemes:
page 41

Lexium 05 motion control
BSH servo motors
Option: encoder integrated in the servo motor

Encoder integrated in the BSH servo motor

Presentation



The standard measurement device is the SinCos Hiperface® single turn or multiturn encoder integrated in BSH servo motors. This measurement device is perfectly suited to the Lexium 05 range of servo drives.

Use of this interface enables:
- Automatic identification of the BSH servo motor data by the servo drive
- Automatic initialization of the servo drive's control loops, thus simplifying installation of the motion control device

Characteristics

Type of encoder		Single turn SinCos	Multiturn SinCos
Sinus periods per turn		128	128
Number of points		4096	4096 x 4096 turns
Encoder precision		± 1.3 arc minutes	
Measurement method		Optical, high resolution	
Interface		Hiperface®	
Operating temperature	°C	- 5...+ 110	

References

BSH servo motor

For selection of the SinCos Hiperface® single turn **1** or multiturn **2** encoder integrated in BSH servo motor, see references on page 81.

Dimensions:
pages 83 to 85

Lexium 05 motion control
BSH servo motors
Option: GBX planetary gearboxes

Presentation

GBX planetary gearbox

In many cases, motion control requires the use of a planetary gearbox to adapt the speeds and torques, while continuing to provide the precision required by the application.

Schneider Electric has chosen to use GBX gearboxes (made by Neugart) with the BSH range of servo motors. These gearboxes are lubricated for life, and are designed for applications that do not require very low backlash. The fact that their use in combination with BSH servo motors has been fully verified and that they are easily assembled, ensures simple, risk-free operation.

The planetary gearboxes are available in 5 sizes (GBX 40...GBX 160) and with 12 reduction ratios (3:1...40:1) (see the table below).

The continuous and peak stall torques available at the gearbox output are obtained by multiplying the characteristic values of the servo motor by the reduction ratio and efficiency of the gearbox (0.96 or 0.94 depending on the reduction ratio).

The following table gives the most appropriate servo motor/gearbox combinations. For other combinations, please see the servo motor data sheets.

BSH servo motor/GBX gearbox combinations

Type of servo motor	Reduction ratio											
	3:1	4:1	5:1	8:1	9:1	12:1	15:1	16:1	20:1	25:1	32:1	40:1
BSH 0551	GBX 40	GBX 40	GBX 40	GBX 60	GBX 40	GBX 40	GBX 40	GBX 40	GBX 60	GBX 60	GBX 60	*GBX 60 **
BSH 0552	GBX 60	GBX 60	GBX 60	GBX 60	GBX 40	GBX 40	GBX 60	GBX 60	GBX 60	*GBX 60 **	*GBX 60 **	*GBX 60 **
BSH 0553	GBX 60	GBX 60	GBX 60	*GBX 60 **	GBX 40	GBX 60	GBX 60	GBX 60	GBX 60	*GBX 60 **	*GBX 60 **	*GBX 60 **
BSH 0701	GBX 60	GBX 60	GBX 80	GBX 80	GBX 60	GBX 60	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120
BSH 0702	GBX 80	GBX 80	GBX 80	GBX 80	GBX 60	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120
BSH 0703	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BSH 1001	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	GBX 160
BSH 1002	GBX 80	GBX 80	GBX 120	GBX 120	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BSH 1003	GBX 80	GBX 120	GBX 120	GBX 120	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BSH 1004	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	*GBX 160 **	*GBX 160 **	*GBX 160 **
BSH 1401	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	*GBX 160 **	*GBX 160 **	*GBX 160 **
BSH 1402	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160 **	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160 **	*GBX 160 **	*GBX 160 **
BSH 1403	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160 **	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160 **	*GBX 160 **	*GBX 160 **
BSH 1404	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160 **	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160 **	*GBX 160 **	*GBX 160 **
BSH 2051	*GBX 160 **	*GBX 160 **	*GBX 160 **	*GBX 160 **	–	–	–	–	–	–	–	–

*GBX 60 ** *For combinations in italics and with an asterisk, you must check that the application will not result in the continuous output torque of the gearbox being exceeded (see values on page 89).*

Characteristics: page 89 References: page 90 Dimensions: page 91

Lexium 05 motion control
BSH servo motors
Option: GBX planetary gearboxes

Characteristics of GBX gearboxes

Type of gearbox			GBX 40	GBX 60	GBX 80	GBX 120	GBX 160
Type of gearbox			Planetary gearbox with single reduction stage and straight teeth				
Backlash in reverse direction	**3:1...8:1**	**min arc**	< 30	< 20	< 12	< 8	< 6
	9:1...40:1		< 35	< 25	< 17	< 12	< 10
Torsional rigidity	**3:1...8:1**	**Nm/min arc**	1.0	2.3	6	12	38
	9:1...40:1		1.1	2.5	6.5	13	41
Sound level		**dB (A)**	55	58	60	65	70
Casing			Black anodised aluminium				
Shaft material			C 45				
Shaft output dust and damp protection			IP 54				
Lubrication			Lubricated for life				
Average service life *(1)*		**h**	30,000				
Mounting position			Any position				
Operating temperature		**°C**	- 25...+ 90				

Characteristics of BSH servo motor/GBX gearbox combinations

Type of gearbox			GBX 40	GBX 60	GBX 80	GBX 120	GBX 160
Efficiency	**3:1...8:1**		0.96				
	9:1...40:1		0.94				
Maximum permitted radial force *(1) (2)*	L_{10h} = 10,000 hours	**N**	200	500	950	2000	6000
	L_{10h} = 30,000 hours		160	340	650	1500	4200
Maximum permitted axial force *(1)*	L_{10h} = 10,000 hours	**N**	200	600	1200	2800	8000
	L_{10h} = 30,000 hours		160	450	900	2100	6000
Gearbox moment of inertia	**3:1**	**kgcm²**	0.031	0.135	0.77	2.63	12.14
	4:1	**kgcm²**	0.022	0.093	0.52	1.79	7.78
	5:1	**kgcm²**	0.019	0.078	0.45	1.53	6.07
	8:1	**kgcm²**	0.017	0.065	0.39	1.32	4.63
	9:1	**kgcm²**	0.030	0.131	0.74	2.62	–
	12:1	**kgcm²**	0.029	0.127	0.72	2.56	12.37
	15:1	**kgcm²**	0.023	0.077	0.71	2.53	12.35
	16:1	**kgcm²**	0.022	0.088	0.50	1.75	7.47
	20:1	**kgcm²**	0.019	0.075	0.44	1.50	6.64
	25:1	**kgcm²**	0.019	0.075	0.44	1.49	5.81
	32:1	**kgcm²**	0.017	0.064	0.39	1.30	6.36
	40:1	**kgcm²**	0.016	0.064	0.39	1.30	5.28
Continuous output torque M_{2N} *(1)*	**3:1**	**Nm**	4.5	12	40	80	400
	4:1	**Nm**	6	16	50	100	450
	5:1	**Nm**	6	16	50	110	450
	8:1	**Nm**	5	15	50	120	450
	9:1	**Nm**	16.5	44	130	210	–
	12:1	**Nm**	20	44	120	260	800
	15:1	**Nm**	18	44	110	230	700
	16:1	**Nm**	20	44	120	260	800
	20:1	**Nm**	20	44	120	260	800
	25:1	**Nm**	18	40	110	230	700
	32:1	**Nm**	20	44	120	260	800
	40:1	**Nm**	18	40	110	230	700

(1) Values given at an output shaft speed of 100 rpm, cyclic ratio = 1 (S1 mode) for electrical machines with an ambient temperature of 30°C.
(2) Force applied midway along the output shaft.

Presentation: page 88
References: page 90
Dimensions: page 91

Lexium 05 motion control
BSH servo motors
Option: GBX planetary gearboxes

References

GBX ●●●

Size	Reduction ratio	Reference (1)	Weight kg
GBX 40	3:1, 4:1, 5:1 and 8:1	**GBX 040 ●●● ●●● ●F**	0.350
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 040 ●●● ●●● ●F**	0.450
GBX 60	3:1, 4:1, 5:1 and 8:1	**GBX 060 ●●● ●●● ●F**	0.900
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 060 ●●● ●●● ●F**	1.100
GBX 80	3:1, 4:1, 5:1 and 8:1	**GBX 080 ●●● ●●● ●F**	2.100
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 080 ●●● ●●● ●F**	2.600
GBX 120	3:1, 4:1, 5:1 and 8:1	**GBX 120 ●●● ●●● ●F**	6.000
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 120 ●●● ●●● ●F**	8.000
GBX 160	3:1, 4:1, 5:1 and 8:1	**GBX 160 ●●● ●●● ●F**	18.000
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 160 ●●● ●●● ●F**	22.000

To order a GBX planetary gearbox, add the following to each of the above references:

			GBX ●●●	●●●	●●●	●	F
Size	Diameter of the casing (see table of combinations with BSH servo motor, page 88)	40 mm	**040**				
		60 mm	**060**				
		80 mm	**080**				
		120 mm	**120**				
		160 mm	**160**				
Reduction ratio		3:1		**003**			
		4:1		**004**			
		5:1		**005**			
		8:1		**008**			
		9:1		**009**			
		12:1		**012**			
		15:1		**015**			
		16:1		**016**			
		20:1		**020**			
		25:1		**025**			
		32:1		**032**			
		40:1		**040**			
Associated BSH servo motor	Type	BSH 055			**055**		
		BSH 070			**070**		
		BSH 100			**100**		
		BSH 140			**140**		
		BSH 205			**205**		
	Model	BSH ●●●1				**1**	
		BSH ●●●2				**2**	
		BSH ●●●3				**3**	
		BSH ●●●4				**4**	
BSH servo motor adaptation							**F**

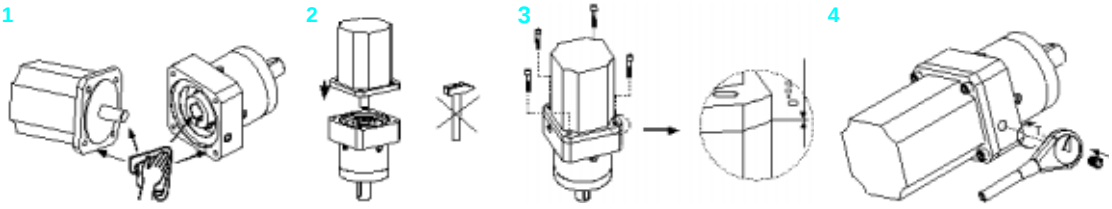
Mounting

No special tool is required for mounting the GBX planetary gearbox on the BSH servo motor. The usual rules for mechanical mounting must be followed:

1 Clean the bearing surfaces and seals.
2 Align the shafts that are to be coupled, and assemble in vertical position.
3 Uniform adhesive force of the servo motor flange on the gearbox flange, with tightening of the Phillips screws.
4 Correct tightening torque of the TA ring using a torque wrench (2...40 Nm depending on the gearbox model).

For more information, please consult the instruction sheets supplied with the products.

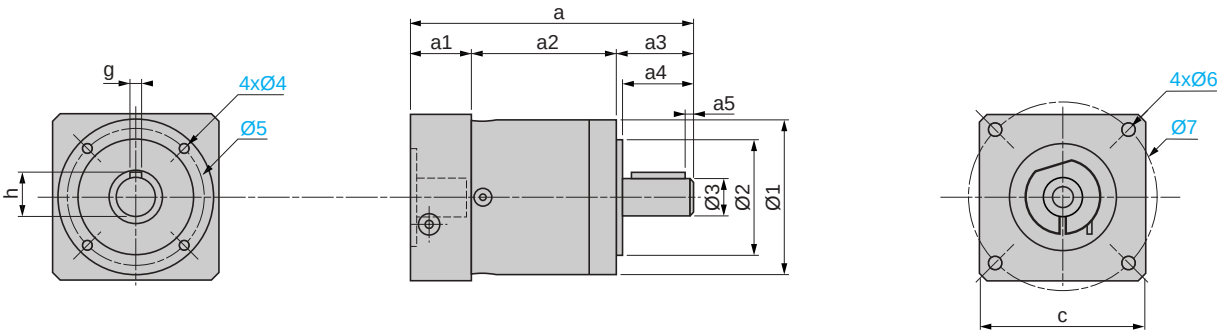
1 2 3 4



Lexium 05 motion control
BSH servo motors
Option: GBX planetary gearboxes

Dimensions

Assembly on servo motor side



GBX	c	a	a1	a2	a3	a4	a5	h	g	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7
040 003...008	40	93.5	28.5	39	26	23	2.5	11.2	3	40	26 h7	10 h7	M4 x 6	34	M4 x 10	46
040 009...016	40	106.5	28.5	52	26	23	2.5	11.2	3	40	26 h7	10 h7	M4 x 6	34	M4 x 10	46
060 003...008	60	106.5	24.5	47	35	30	2.5	16	5	60	40 h7	14 h7	M5 x 8	52	M5 x 12	63
060 009...040	60	118.5	24.5	59	35	30	2.5	16	5	60	40 h7	14 h7	M5 x 8	52	M5 x 12	63
080 003...008	90	134	33.5	60.5	40	36	4	22.5	6	80	60 h7	20 h7	M6 x 10	70	M6 x 15	100
080 009...032	90	151	33.5	77.5	40	36	4	22.5	6	80	60 h7	20 h7	M6 x 10	70	M6 x 15	100
120 003...008	115	176.5	47.5	74	55	50	5	28	8	115	80 h7	25 h7	M10 x 16	100	M8 x 20	115
120 009...040	115	203.5	47.5	101	55	50	5	28	8	115	80 h7	25 h7	M10 x 16	100	M8 x 20	115
160 003...008	140	255.5	64.5	104	87	80	8	43	12	160	130 h7	40 h7	M12 x 20	145	M10 x 25	165
160 009...040	140	305	64.5	153.5	87	80	8	43	12	160	130 h7	40 h7	M12 x 20	145	M10 x 25	165

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Characteristics: page 89
References: page 90

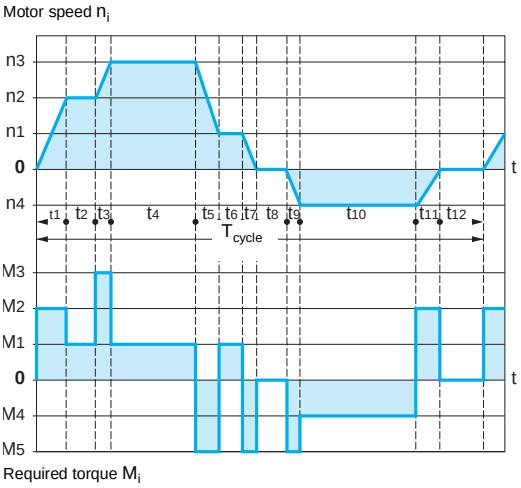
Lexium 05 motion control
BSH servo motors

Sizing the servo motor

The "**Lexium Sizer**" sizing tool is available on the www.telemecanique.com website to help you size your servo motor.

These 2 pages are provided to help you understand the calculation method used.

To be able to size the servo motor you need to know the equivalent thermal torque and the average speed required by the mechanism to be used with the servo motor. Both values are calculated using the motor cycle timing diagram and should be compared with the torque/speed curves given for each servo motor (see BSH servo motor curves, on pages 56 to 78).



Motor cycle timing diagram

The motor cycle is made up of several sub-cycles, the duration of which is known. Each sub-cycle is divided into phases which correspond to the periods of time during which the motor torque is constant (1 to 3 phases maximum per sub-cycle).
This division into phases can be used to calculate the following for each phase:

- Duration (tj)
- Speed (n_i)
- Required torque value (M_i)

The curves on the left show the four types of phase:

- Constant acceleration during times t_1, t_3 and t_9
- At work during times t_2, t_4, t_6 and t_{10}
- Constant deceleration during times t_5, t_7 and t_{11}
- Motor stopped during times t_8 and t_{12}

The total duration of the cycle is:

$T_{cycle} = t_1 + t_2 + t_3 + t_4 + t_5 + t_6 + t_7 + t_8 + t_9 + t_{10} + t_{11} + t_{12}$

Calculating the average speed n_{avg}

The average speed is calculated using the formula: $n_{avg} = \dfrac{\sum |ni| \cdot t_j}{\sum t_j}$

- n_i corresponds to the different work speeds
- $\dfrac{ni}{2}$ corresponds to the average speeds during the acceleration phases constant and constant deceleration

In the above example:

Duration tj	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}	t_{11}	t_{12}
Speed $\lvert ni \rvert$	$\frac{\lvert n2 \rvert}{2}$	$\lvert n2 \rvert$	$\frac{\lvert n3 \rvert + \lvert n2 \rvert}{2}$	$\lvert n3 \rvert$	$\frac{\lvert n3 \rvert + \lvert n1 \rvert}{2}$	$\lvert n1 \rvert$	$\frac{\lvert n1 \rvert}{2}$	0	$\frac{\lvert n4 \rvert}{2}$	$\lvert n4 \rvert$	$\frac{\lvert n4 \rvert}{2}$	0

The average speed is calculated as follows:

$$n_{avg} = \frac{\frac{n2}{2} \cdot t1 + n2 \cdot t2 + \frac{n3+n2}{2} \cdot t3 + n3 \cdot t4 + \frac{n3+n1}{2} \cdot t5 + n1 \cdot t6 + \frac{n1}{2} \cdot t7 + \frac{n4}{2} \cdot t9 + n4 \cdot t10 + \frac{n4}{2} \cdot t11}{Tcycle}$$

Calculating the equivalent thermal torque M_{eq}

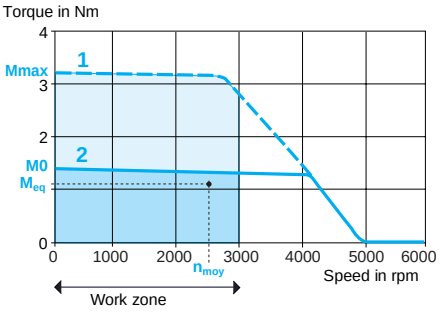
The equivalent thermal torque is calculated using the formula:

$$M_{eq} = \sqrt{\frac{\sum Mi^2 \cdot t_j}{Tcycle}}$$

In the above example, this formula gives the following calculation:

$$M_{eq} = \sqrt{\frac{M2^2 \cdot t1 + M1^2 \cdot t2 + M3^2 \cdot t3 + M1^2 \cdot t4 + M5^2 \cdot t5 + M1^2 \cdot t6 + M5^2 \cdot t7 + M5^2 \cdot t9 + M4^2 \cdot t10 + M2^2 \cdot t11}{Tcycle}}$$

Lexium 05 motion control
BSH servo motors



Sizing the servo motor (continued)

Determining the size of the servo motor

The point defined by the two preceding calculations (average speed and equivalent thermal torque) where the:

- horizontal axis represents the average speed n_{avg}
- vertical axis represents the thermal torque M_{eq}

must be within the area bounded by curve **2** and the work zone.

The motor cycle timing diagram should also be used to ensure that all torques M_i required for the different speeds n_i during the various cycle phases are within the area bounded by curve **1** and the work zone.

1 Peak torque
2 Continuous torque

Product reference index

B

BSH 0551T 80
BSH 0552M 80
BSH 0552P 80
BSH 0552T 80
BSH 0553M 80
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